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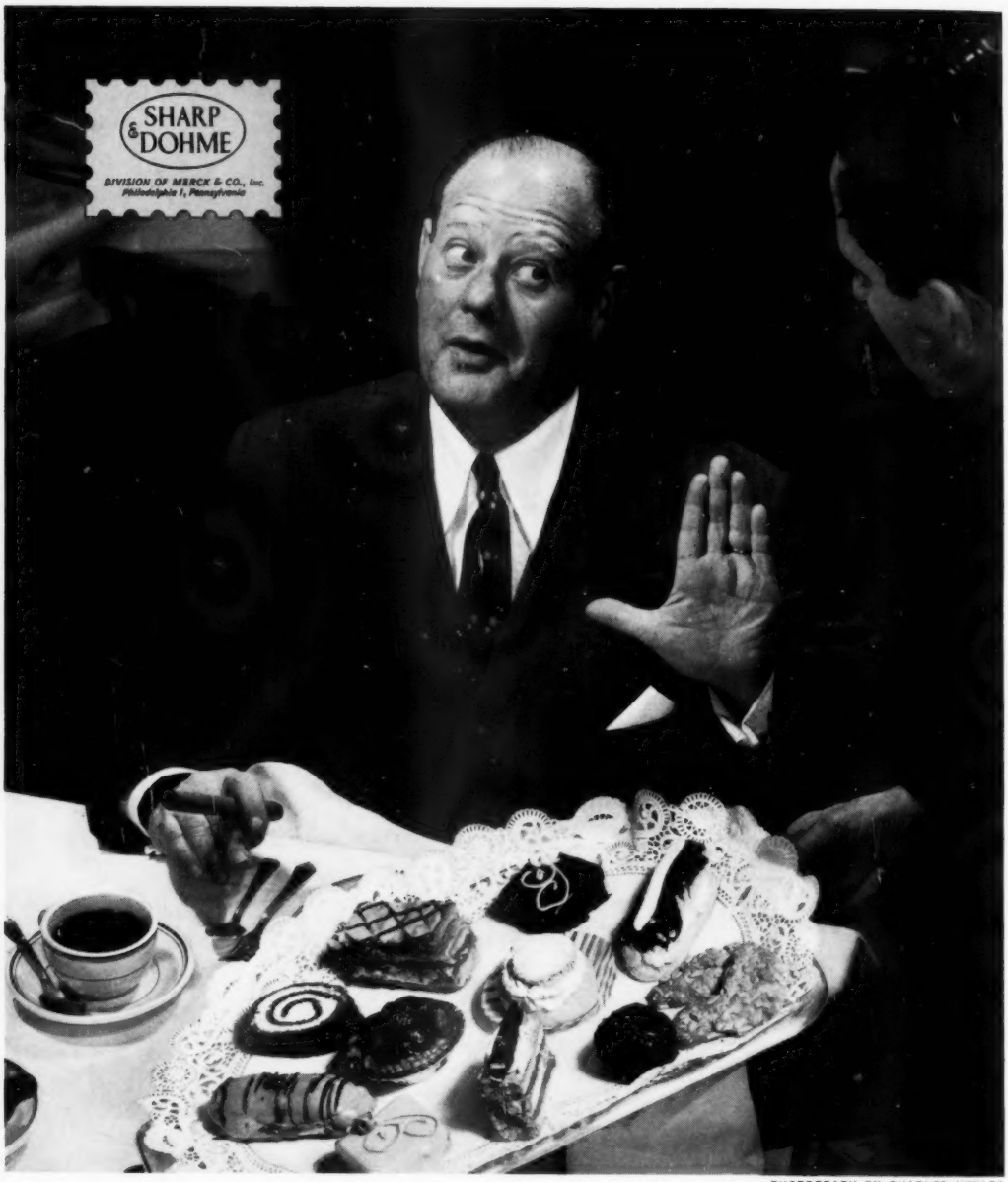

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Decompression of the Gasserian Ganglion and Its Posterior Root for Trigeminal Neuralgia

J. GRAFTON LOVE*

Mayo Clinic, Rochester, Minnesota

Most patients with trigeminal neuralgia who have undergone decompression of the gasserian ganglion and posterior root have been helped. The operation should be offered to those who have trigeminal neuralgia requiring surgical intervention.

J. GRAFTON LOVE

TRIGEMINAL neuralgia, trifacial neuralgia, facial neuralgia and tic douloureux all are names for a very severe recurring paroxysmal pain in one or more branches of the fifth cranial nerve. Although the pain usually is unilateral, it may be bilateral and has been so reported in an incidence varying from 2 to 5 per cent of cases.

Antecedent Studies

This severe, disabling, painful condition has been known for centuries, but the first clear-cut description was given by John Fothergill[1] of England in 1773. Although Fothergill's description of the pain was accurate, his view of the pathologic process was erroneous, for he thought the pain must be cancerous in origin. This hypothesis was proved incorrect, and since then many opinions regarding cause have been advanced.

Wilfred Harris,[2] also of England, felt that true trigeminal neuralgia is peripheral in origin and "probably due to septic neuritis of nerve filaments in the maxilla or mandible."

In ordinary true trigeminal neuralgia that has not been treated by injection or surgery, results of neurologic examination of the distribution of the fifth cranial nerve are normal. Harris wrote that "in all cases of persistent or recurrent pain anesthesia must be looked for. If it is present in trigeminal cases then either syphilitic neuritis, gumma or tumour is the cause."

Incidence of the Disease

Nowadays, in consequence of the successful treatment of syphilis with penicillin, syphilitic involvement of the nervous system is rare. My associates and I ordinarily think of tumor (neoplasm), aneurysm of the intracranial portion of the internal carotid artery or sarcoidosis—and in the order given—if there is loss of function of the fifth nerve. Occasionally, a tumor is encountered which involves the

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gasserian ganglion and posterior root of the trigeminal nerve and produces trigeminal neuralgia but without any objective neurologic findings.[3]

Fortunately—for the individual patient—trigeminal neuralgia is a rather rare disease. At the Mayo Clinic approximately 200 patients suffering from this condition have been seen each year for the past 10 years. The other major neuralgia of the head, glossopharyngeal neuralgia, is much less common. Ordinarily, my associates and I annually operate on about 5 patients who have glossopharyngeal neuralgia.

Diagnostic Features

At times there may be a confusing similarity between neuralgia of the third branch of the trigeminal nerve and glossopharyngeal neuralgia. The pain of trigeminal neuralgia is more likely to be set off by touching or stroking the chin and lower part of the face and by exposure of these regions to wind or cold; the pain of glossopharyngeal neuralgia is characteristically set off by swallowing or by touching the tonsillar fossa of the involved side. Blocking of the third branch of the trigeminal nerve will relieve neuralgia of that branch, but will have no effect on the pain of glossopharyngeal neuralgia. Likewise, cocainization of the tonsillar fossa will prevent a paroxysm of glossopharyngeal neuralgia when the patient is asked to drink a glass of water, but it will have no effect on mandibular (third) division trigeminal neuralgia.

Treatment of Trigeminal Neuralgia

General—Various remedies have been tried, and most of them in time have been discarded. Fothergill[1] could relieve the pain with morphine, but the treatment often became worse than the disease. He felt that hemlock pushed to toxic doses was a cure.

At one time inhalations of trichlorethylene were recommended as a medical treatment, and more recently vitamin B_{12} has had its proponents.[4] Daly and Rushton,[5] however, have been disappointed with their results in the treatment of trigeminal neuralgia with vitamin B_{12}.

Stretching the branches of the trigeminal nerve, cutting the peripheral branches and avulsing them were all methods of treatment in Victor Horsley's[6] day.

The injection of alcohol for trigeminal neuralgia was introduced by Schlösser[7] of Munich in 1903. Deep injections of alcohol into the branches of the nerve at their foramina of exit from the skull have been used since. The procedure is rather painful unless the patient is under the influence of general anesthesia, and the average relief of pain is about nine months. The alcohol causes a temporary interruption of the nerve pathway; when the anesthesia of the face disappears the pain usually recurs. Subsequent injections of alcohol as a rule are less effective.

Surgical—The method of treatment which results in cure and enjoys the greatest period of acceptance is division of the sensory root of the gasserian ganglion. This was recommended by Spiller[8] in 1898, and was first successfully carried out by Frazier[8] in 1901. This surgical procedure results in anesthesia of the face, an effect that was considered a *sine qua non* of successful treatment until 1951. That is, it was assumed that the patient suffering from trigeminal neuralgia must accept anesthesia if he were to be rid of his pain.

If the sensory fibers of the ophthalmic division of the fifth nerve are divided, there results anesthesia of the cornea. Keratitis, which can be a serious complication, may develop. To obviate this potential danger, subtotal section of the sensory root (sparing of the ophthalmic fibers) was advised in some cases, particularly those in which there was no pain in the first division and for those patients engaged in occupations where foreign bodies are likely to get into the eyes.[9]

In 1938 Sjöqvist[10] devised his tractotomy operation which preserves the sensation of touch while interrupting the pain and temperature fibers. Unfortunately, this operation has not accomplished all that was hoped for it, and the complications may be severe.[11,12]

More recently, Shelden and Pudenz[13] have been enlarging the foramina ovale and rotundum in order to relieve the pain and yet preserve all qualities of sensation.

In May 1951, Palle Taarnhøj[14] of Copenhagen operated on a patient with trigeminal neuralgia and was able to relieve the pain by "decompressing" the ganglion and root without interrupting any sensory fibers, and this avoided postoperative anesthesia of the face, tongue and eye. Information which I obtained regarding this operative procedure from Gösta Norlén[15] of Stockholm led me to perform this operation first on June 12, 1952.[16] That patient was immediately relieved of her trigeminal pain and has remained pain-free since (now 15+ months).

Taarnhøj[14] and Norlén[15] employed an intradural approach to the ganglion and root, whereas after careful anatomic studies I adopted an extradural approach and have used it in all my cases. This is the technic used by my neurosurgical associates at the Mayo Clinic.

The exact technic which I have employed is as follows: With the patient, in the sitting position, receiving drop ether over the end of a Magill intratracheal tube, with the zygomatic arch parallel to the floor, a 3 inch (7.5 cm.) incision is made one finger's breadth anterior to the tragus of the ear, extending upward and slightly backward from the zygomatic arch. The skin, temporal fascia, temporal muscle and pericranium are incised in the same plane down to the squamosal portion of the temporal bone. A self-retaining retractor[17] is placed, and then the squamosa is perforated and the perforator opening is enlarged with rongeurs until it is almost as large as a half dollar—1⅛ inches (2.8 cm.). The dura mater lining the floor of the middle fossa is then separated until the middle meningeal artery entering the skull through the foramen spinosum is exposed. The artery is ligated with black silk and divided just above the foramen. The dura, which is densely adherent to the third branch (mandibular division) of the trigeminal nerve, is stripped from the foramen ovale upward and backward to expose in turn the intracranial portion of the third branch, the gasserian ganglion and the dura propria (the specialized arachnoid) over the adjacent portion of the posterior root of the ganglion.

Up to this point the technic is the same as the one my associates and I have used previously for sectioning the posterior root in typical transtemporal retrogasserian neurotomy. Now, instead of opening the dura propria to expose the sensory root, the dura propria is preserved intact to prevent the possible development of adhesions and the binding together of the sensory fibers and motor root at the posterior end of the ganglion.* To expose the posterior root adequately, the reflected fibers from the dura mater to the petrous ridge are divided with a ureteral knife.† The arcuate fibers above the posterior root and under the temporal lobe are now visualized. A right-angled knife is used to incise the dura mater through the arcuate fibers forward over the posterior root and ganglion. A small portion of the undersurface of the temporal lobe and the superior surface of the tentorium cerebelli are now seen.

The last and most important part of the decompression is accomplished now by dividing the dense, tense, constricting fibers overlying the posterior root as it crosses the petrous ridge to enter the posterior fossa and join the pons. At this time cerebrospinal fluid from the posterior fossa begins to well up in the operative field, and the posterior root is clearly visible, floating freely in the fluid. In about two-thirds of the patients the superior petrosal sinus must be divided to achieve adequate decompression. In some cases the sinus is so placed that it is unnecessary to divide it. If the sinus is divided it can be controlled with silver clips‡ or GELFOAM.® It

*If adhesions were to develop here, pain might recur. Furthermore, if the patient is not relieved by decompression of the ganglion and posterior root, subsequently sensory root section, subtotal or total, can be performed with ease.

†At this point the greater superficial petrosal nerve is often visualized. If, in order to elevate the dura sufficiently for exposure, the nerve is subjected to traction and tension, it should be divided so as to avoid traction on the geniculate ganglion. Traction on this ganglion is likely to result in postoperative facial palsy. If no traction is evident on the greater superficial petrosal nerve, it is left alone.

‡If silver clips are used, the points of the clip holder should be turned toward rather than away from the root to avoid injury to the oculomotor nerves.

should not be coagulated, because the current may "jump" to adjacent structures and cause harm.

After it is assured that the posterior root and ganglion are thoroughly decompressed and all bleeding is controlled, the wound is closed in layers without drainage.

Comment

Most of the patients who undergo this operation are relieved of their trigeminal neuralgia without the inconvenience of facial anesthesia and the danger of corneal irritation. They need no special care for the eye; they need not wear ganglion goggles, and, if they should be so unfortunate as to have trigeminal neuralgia on the opposite side or if it should develop, there is no need to worry about paralysis of the muscles of mastication or about total anesthesia of the face and mouth.

Since the adoption of this operative procedure for trigeminal neuralgia it has been offered to every patient with the disease experiencing sufficient pain to warrant operation. It has been explained to the patients why it is important to preserve sensation, and also that if this operation is not successful, the injection of alcohol or total or subtotal sensory root section can still be carried out and with greater ease.[18]

Most patients have accepted the new operation, and most patients have been relieved by decompression of the ganglion and posterior root. Some patients have not obtained relief from this operation, and they have been advised to have the involved branch or branches injected with alcohol or to undergo total or subtotal section of the sensory root of the gasserian ganglion.

My associates and I have had little success in relieving the pain in atypical facial pain syndromes.

Insufficient time has elapsed since this operative procedure was introduced to permit knowledge of what the ultimate long-term follow-up study will reveal. I believe a certain percentage of recurrence of pain is to be expected. What this percentage will be cannot be stated at present. I have had 3 patients report that their pain returned after 13 months of relief after the decompression operation.

The situation at present is this: The majority of patients suffering from trigeminal neuralgia have been relieved by decompression of the gasserian ganglion and posterior root. It is my belief that the operation should be offered to patients who have trigeminal neuralgia requiring operative intervention because the operation ensures that they will not be deprived of facial and corneal sensation which is important to a patient's well-being.

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Gangrenous Bowel; Current Therapeutic Concepts

C. P. SCHLICKE

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A reveiw of current concepts in the management of gangrenous bowel is presented, along with some illustrative cases. The following axioms are suggested: Rule out intestinal obstruction in any patient having abdominal pain. Maintain a high index of suspicion for strangulation when obstruction is considered. Treat shock and correct fluid and electrolyte imbalance. Employ intubation judiciously. Remove gangrenous bowel as early as possible and restore intestinal continuity, eliminating the cause of obstruction, if possible. Utilize ancillary agents to maximum effectiveness but avoid excessive dependence upon them.

C. P. SCHLICKE

THE most important single factor influencing morbidity and mortality in patients having intestinal obstruction is the viability of the affected bowel. Basic classifications of etiology distinguish primarily between causes inherently associated with strangulation and causes in which impairment of blood supply is not an important consideration. Much has been written concerning criteria for the recognition of strangulation obstruction, the importance of the time element in therapy and the manner of coping with the dread complication of devitalized bowel. Yet the problem remains with us. Unfortunate delays due to failure of recognition add to the difficulty, and the results of treatment leave much to be desired. There have been such radical changes in recent years in the whole field of bowel surgery, because of new concepts in the management of shock and infection, better anesthesia and the development of a multitude of new therapeutic adjuncts that it seemed a review of current methods of dealing with the problem of devitalized bowel might be of interest.

Presented at the annual meeting of the Washington State Medical Association, Seattle, Washington, 1953.

Fluid and Electrolyte Balance

Fluid, electrolyte and nutritional imbalances are the inevitable complications of intestinal obstruction. Their influence on morbidity and mortality is great. Initially an estimation should be made of the patient's immediate needs for correction of existing imbalances, and his losses for the next 12 to 24 hours should be anticipated insofar as is possible. It should be axiomatic that the older the patient, the sicker the patient and the poorer his cardiac, renal or respiratory reserve, the greater the attention which must be given to the problems of fluid, electrolyte and nutritional imbalance. A detailed history will inform us of the patient's intake and output since the onset of his illness and will reveal the possibility of impaired cardiac, renal or respiratory function. A careful physical examination will supplement this information, and

particular attention should be given to the patient's mental status, his blood pressure, skin turgor, coloring and the state of hydration of his mucous membranes.

Additional studies of importance are the hematocrit, the serum electrolytes and the urinary chloride concentration. Needless to say, an accurate fluid intake-output record is essential. On the basis of this assembled information we can then intelligently order fluids, electrolytes and calories as needed. In replacing deficits, we must remember that the body tolerates losses of water poorly and losses of salt well. Conversely, it tolerates excesses of water well and excesses of salt poorly. In anticipating losses we must allow from 1000 to 2000 cc. of fluid per 24 hours for sensible and insensible loss. The amount decided on will depend on the presence or absence of fever, sweating, etc. Urinary output is customarily and arbitrarily set at a level of 1000 to 1500 cc. per 24 hour period. This figure presumes normal renal function and is a volume which provides the kidneys with the best opportunity to regulate fluid balance. Electrolyte and fluid retention is most apt to occur in the immediate postoperative period, possibly as a result of transient impairment of renal blood flow during surgery. During the first 24 to 48 hours after operation excesses of physiologic saline may result in pulmonary edema, and excesses of water may result in water intoxication.

Fluids and electrolytes lost by vomiting or removed by suction and drainage tubes should be replaced as quantitatively and qualitatively as possible. Gastric and intestinal replacement solutions are now available, the former containing an excess of chloride ions to prevent alkalosis, the latter an excess of sodium ions to prevent acidosis. Parenteral fluid should be given subcutaneously with considerable caution, particularly in the presence of dehydration or salt depletion. The introduction of electrolytes and glucose into the interstitial space may result in the shift of water from the circulating plasma into the interstitial space with a resultant decrease in circulating blood volume.

The greatest danger of excessive fluid administration occurs when there is impaired renal function. In certain individuals with peritonitis or following transfusion reaction or prolonged shock, a renal shutdown occurs, currently referred to as lower nephron nephrosis. In this condition little or no urine may be excreted for a week or two, and nitrogenous waste products, potassium and acids accumulate. In these individuals, excesses of either fluid or electrolyte may be lethal. Such patients should receive only sufficient fluid and electrolyte to replace sensible and insensible loss and gastrointestinal loss, but they must receive adequate calories to keep to the irreducible minimum the breakdown of endogenous protein and fat in order to prevent uremia and acidosis.

Gastric suction is valuable in acute tubular nephrosis since fluid is removed which contains potassium and waste products in proportion to their concentration in body fluid. Caloric requirements can best be met by the intravenous infusion of 10 per cent glucose and ethyl alcohol. If renal function returns, recovery may be complete, but such severe trauma may render the kidney unable to regulate fluid and electrolyte balance; therefore, in the diuretic period, profound imbalance and shock may result if constant vigilance is not exercised.

The obstructed patient with continuous gastrointestinal suction is the ideal candidate for the development of potassium depletion. He has no oral intake of potassium; he is losing potassium in the amount of 10 mEq. or more per liter of gastric suction, and renal losses of potassium continue apace with renal output, regardless of depletion. Weakness, anorexia, lassitude, mental confusion, flaccid paralysis and persistent distention may be manifestations of hypokalemia. If potassium deficiency is suspected and a flame photometer is not accessible, an electrocardiogram is helpful in recognizing hypokalemia. Potassium chloride is supplied in special replacement solutions or may simply be added to standard solutions. This should be administered slowly as an excess may cause heart block. In addition to the negative fluid, caloric and electrolyte balances affecting patients

with strangulation obstruction, there is also a negative nitrogen balance from starvation and marked vitamin deficiency. Blood, plasma and protein hydrolysate solutions are helpful in replacing nitrogen but not adequate for maintaining a positive balance. Accordingly, the value of these costly products is questionable for short-term parenteral alimentation. The best source of nitrogen is orally ingested protein and one of the prime aims of treatment should be to make this available as soon as possible. Vitamin supplements, particularly thiamine, 20 to 40 mg.; niacin, 100 to 200 mg.; ascorbic acid, 200 to 500 mg.; riboflavin, 5 to 10 mg., and vitamin K, 3 to 5 mg., should be included in the daily fluid intake.

Intubation

The aims of intubation should be to empty the stomach as a safeguard against aspiration during anesthetization. If some deflation of the bowel can be attained by this method during the time the patient is undergoing preparation for operation, it will render the operative procedure technically easier, but prolonged attempts at passing a long intestinal tube are undoubtedly responsible for more cases of gangrene than they have prevented. The treatment of intestinal obstruction is surgical except in the immediate postoperative period, in the case of the occasional patient in whom obstruction is due to postoperative adhesions and, as a rule, in the presence of inoperable malignancy. Postoperatively, of course, the tube is invaluable in preventing distention with all its attendant deleterious effects both systemically and locally on the suture line after resection.

Management of Shock

The principal cause of shock in strangulation obstruction is blood loss into the bowel and peritoneal cavity. Blood transfusion is the best means of compensating for this. Plasma expanders such as dextran are of value until blood is available.[1] Pooled plasma and other blood derivatives are being used less frequently because of the dangers of homologous serum jaundice. Fortunately, we now have at our disposal potent vasoconstrictor substances by means of which we can artificially sustain blood pressure in acute hypotensive states.[2,3] Four cubic centimeters of 1:1000 solution of levophed ARTERENOL® in a liter of 5 per cent glucose in distilled water or normal saline often can achieve the desired level of blood pressure necessary to get a seemingly moribund patient into condition for surgery. This is administered slowly, the minimum rate of flow being maintained which will keep the blood pressure up. Care must be exercised to prevent tissue necrosis and ulceration at the site of injection.[4]

A patient who has been critically ill for longer periods (days) may be greatly benefited by administration of ACTH or cortisone.[5] As such a patient is being decompensated insofar as his adaptability to additional stress is concerned, it would seem more logical to use cortisone than corticotropin. An amazing improvement in the patient's general condition may occur after the first or second intramuscular injection of 100 mg. of cortisone. With doses of this size, administered every six hours over the short period of time necessary to get the patient in condition for surgery, there is no evidence of interference with wound healing,[6] increased likelihood of perforation or metabolic disturbance.

Choice of Anesthesia

For the average case spinal anesthesia is the choice. There is less danger of aspirating vomitus and the complete relaxation essential for satisfactory operative manipulation is readily attained. Curare has widened the scope of PENTOTHAL® sodium anesthesia and, when skillfully administered with an intratracheal tube in place, this combination is often satisfactory. The patient *in extremis* who cannot be exposed to the risk of any further depression of vital processes or fall of blood pressure is best managed by the liberal use of local infiltration anesthesia, usually 1 per cent NOVOCAINE® supplemented by as little cyclopropane and as much oxygen as possible.

Surgical Technic

A transverse incision is least apt to disrupt but may be most disadvantageous if the exact

site of obstruction is not known. In any event the incision should be generous and as near the site of obstruction as possible. Gangrenous bowel should be delivered from the wound at once along with as much dilated bowel as is necessary to obtain a clear view of the site and cause of the obstruction. Much precious time may be wasted wallowing around blindly among dilated intestinal loops. In removing a long gangrenous segment the procedure may be greatly expedited by cutting across the root of the mesentery. In this fashion a few well-placed clamps will do the work of a great number placed near the mesenteric border (figure 1). Naturally the cause of the obstruction should be removed or corrected, if possible. For restoration of intestinal continuity, end to end anastomosis is the quickest and easiest method. If there is marked disparity between the size of the proximal dilated bowel and the distal collapsed bowel, this can readily be compensated for by cutting the distal bowel obliquely and, if necessary, splitting it along its antimesenteric border (figure 2). Care should be exercised not to spill noxious bowel contents into the peritoneal cavity or wound, but elaborate attempts at so-called aseptic anastomosis may do more harm than good. While the abdomen is open it is often feasible to manipulate a long intestinal tube, previously passed into the stomach via the nose, down into the small bowel and remove much of the accumulated gas and fluid. This is just as satisfactory and a great deal safer than making an opening into the bowel to evacuate fluid.

A few years ago exteriorization procedures were mandatory if the large bowel was the site of strangulation. Now primary anastomosis is applicable even in this location.[7] In rare instances, however, even in the small bowel exteriorization may be lifesaving provided the lesion is not so high that the depletion attending a high fistula does not constitute a greater hazard than a protracted operation or an insecure anastomosis. Proximal decompressive vents in general are more dangerous than helpful. Through and through wire closure of the abdominal wall is often quite a satisfactory procedure.

Use of Antibiotics

Pemberton[8] has likened the changes wrought by chemotherapy in bowel surgery to those produced by iodine therapy in surgery of the thyroid gland. To be sure, chemotherapeutic and antibiotic agents are not a substitute for good surgical technic, attention to blood supply and avoidance of tension on suture lines, but they have made possible a bold one stage approach to many problems formerly very difficult to solve. AUREOMYCIN® and TERRAMYCIN® have a wide antibacterial spectrum, seldom promote resistance and are the agents most effective against the organisms usually associated with peritonitis. One or the other may be started parenterally before surgery and continued by this route afterward until oral administration is tolerated. Happily, a form of Terramycin is being developed which may be used intramuscularly, thus avoiding the obvious disadvantages of frequent intravenous usage. Dosage should be adequate, 1 or 2 gm. a day intravenously, 1 to 3 gm. a day orally and 200 to 400 mg. a day intramuscularly. The only real hazard associated with their use seems to be the possible development of pseudomembranous colitis after oral administration, or of phlebitis after intravenous use. When these drugs are not tolerated a penicillin-streptomycin mixture may be used, though less effectively. Its use in conjunction with Aureomycin or Terramycin is thought by some to be antagonistic rather than synergistic.

The chemotherapeutic agents so valuable in the preparation of patients for elective bowel surgery are seldom used in these cases. Neomycin is a very effective broad spectrum antibiotic suitable for topical use and at operation 1 gm. in 100 cc. of normal saline instilled into the peritoneal cavity before closing the abdomen does no harm and may be helpful. Poth[9] even has suggested injection of 1000 cc. of 1 per cent solution of neomycin through a needle into the unprepared bowel to effect rapid sterilization of its contents.

Illustrative Cases

Case 1—M. P., a white woman, 69 years

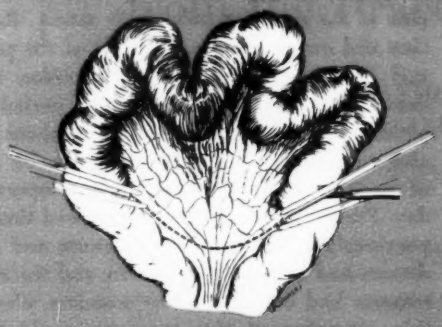

FIGURE 1. Method of resecting bowel cutting across root of mesentery.

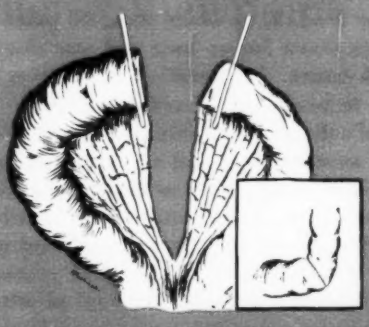

FIGURE 2. Method of cutting distal collapsed loop obliquely to compensate for disparity in size.

old, with symptoms of 12 hours' duration, had an immediate operation for strangulated right femoral hernia. Three inches of gangrenous ileum with an associated Meckel's diverticulum were resected. End to end anastomosis was performed and the hernia was repaired. Convalescence was uneventful.

Case 2—P. C., a white man, 83 years old, had symptoms for three days. There was an old history of left inguinal hernia, but none was noted on examination. The patient was observed in the hospital for five days. At operation he was found to have 6 inches of gangrenous jejunum, the inguinal hernia having been reduced en masse. Free perforation and peritonitis were present. Resection, anastomosis and repair of the hernia were done, but the patient died of peritonitis on the fourth postoperative day.

Case 3—M. S., a white woman, aged 52, had symptoms for 12 hours and was observed in the hospital for 24 hours. A strangulated hiatal hernia was found at operation and 6 inches of gangrenous jejunum were resected. An end to end anastomosis was done but no attempt was made to repair the hernia because of the patient's obesity and poor condition. Convalescence was complicated by evisceration, but, on the eighteenth postoperative day, the patient left the hospital well except for incisional and hiatus hernias.

Case 4—M. W., a white woman, 46 years old, had symptoms for five hours and was observed for 18 hours. At operation obstruction was found to be due to adhesions resulting from uterine suspension and 6 inches of gangrenous ileum were resected. An end to end anastomosis was done and recovery was uneventful.

Case 5—H. P., a white woman of 48, had symptoms for 24 hours and was observed for 24 hours. Obstruction was found to be due to adhesions resulting from a hysterectomy. There were 10 inches of gangrenous ileum with free perforation and peritonitis. Resection and anastomosis were carried out. Convalescence was complicated by ileus and wound infection.

Case 6—L. D., a white woman, 41 years old, had symptoms for 24 hours and was observed for four days because of a mistaken impression of pelvic inflammatory disease. A foot and a half of gangrenous ileum was found to be disintegrating in a walled-off area of localized peritonitis. The patient was moribund. Exteriorization, resection and double-barreled ileostomy were performed. The postoperative course was complicated by peritonitis, pneumonia, cystitis and emaciation. The patient recovered and, following closure

of the ileostomy, left the hospital 45 days after the initial operation.

Case 7—J. E., a white man, 50 years old, had symptoms for an hour and was observed for 24 hours. At operation obstruction was found to be due to a band associated with a Meckel's diverticulum. Six feet of gangrenous bowel were removed and an end to end anastomosis of the jejunum to the terminal ileum was performed. The patient was moribund when brought to surgery and exhibited practically no vital signs. The surgical procedure was carried out chiefly under local anesthesia, with continuous intravenous drip of levophed being used to maintain enough pressure to keep him alive. Interestingly enough, this lifesaving agent caused the only postoperative complication, namely, a slough surrounding the point of injection at the ankle which required grafting. Initially, during the postoperative period, there was some weight loss but this was soon recovered. The patient now has one stool a day and is quite well except for rheumatoid arthritis which he has had for many years.

Case 8—W. K., a white man, 43 years old, had symptoms for three days. Six days were spent trying to prepare him for surgery. Finally, with the use of cortisone, he improved rapidly. At operation the bowel was found to be gangrenous from a point on the jejunum 10 inches below the ligament of Treitz to the lower descending colon as a result of occlusion of the superior mesenteric artery. Resection and end to end anastomosis of the proximal jejunum to the descending colon were done. In the initial postoperative period the patient did very well, was up and about and able to take nourishment. However, he died of peritonitis on the seventh postoperative day. Postmortem examination showed that the previously viable proximal jejunum and duodenum had become gangrenous and the anastomosis had disrupted. One wonders whether this extension of the gangrene could have been prevented by anticoagulant drugs.

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THE CONSULTATION

You will remember, of course, always to get the weather-gage of your patient, I mean, to place him so that the light falls on his face and not on yours. It is a kind of ocular duel that is about to take place between you; you are going to look through his features into his pulmonary and hepatic and other internal machinery, and he is going to look into yours quite as sharply to see what you think about his probabilities for time and eternity.

Oliver Wendell Holmes

Mitral Stenosis; Surgical Therapy from the Practitioner's Viewpoint

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The authors outline their present policy with regard to indications for surgery in cases of mitral stenosis. They believe their scientific objectives will encourage constant revision of these indications in the future in case new procedures and more conclusive long-term observations require the modification of these indications. Time and continuous research will be the determining factors in this matter.

THE surgical therapy of acquired heart disease has made tremendous strides during the past 5 years.[1-4] Commissurotomy for relief of the stenotic mitral valve is now a generally accepted procedure. Consequently the practitioner is faced with an added responsibility in his management of mitral stenosis, since he must be alert to recognize those cases which may be benefited by definitive surgery.

NICHOLAS A. ANTONIUS

This communication is presented as a guide to the general practitioner, to assist him in the preliminary screening of his patients with mitral stenosis. It is an outline of our views on mitral commissurotomy based on the experience with our first 60 operative cases. The operative results will be published in detail elsewhere.

Natural History of Mitral Stenosis

Clinically detectable stenosis of the mitral valve appears at a variable period of time after an attack of acute rheumatic carditis. It has been taught that many years must elapse before the signs of stenosis develop. This view was based on observations of the natural history of the disease in patients who had known rheumatic episodes during childhood and who were followed for many years before auscultatory or roentgen evidence of stenosis could be found. Some doubt must be cast on the validity of this concept for 2 reasons: (1) A number of patients have been known to develop stenosis within a relatively short time after an initial attack of carditis, and (2) in less than 50 per cent of patients with mitral stenosis can a history of acute rheumatic fever be elicited. Thus in the latter group of patients one has no idea as to the length of time the process required to develop.

Whatever the time relationship of its appearance, once mitral stenosis is present there are certain definite effects on the circulation. With gradual decrease in the size of the mitral orifice there is a corresponding increase in the difficulty with which blood flows from the left atrium into the left ventricle. A point is reached at which the valve is so contracted that the atrium cannot empty completely.

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Pressure within this chamber rises and dilatation results. This increased pressure is transmitted to the pulmonary venous system, which in turn dilates when its reserve capacity is exhausted. Pulmonary capillary pressure is increased. This means that resistance to pulmonary artery and right ventricular flow also is increased. There is a resulting rise in pulmonary artery and right ventricular pressures with dilatation of the arteries and hypertrophy of the ventricular wall. This process varies in time and degree. The effects on the right heart may be long in appearing or—depending on a number of complex factors, including the degree of stenosis—may never appear. On the other hand, the whole cycle of events may be completed with relative rapidity.

The appearance of symptoms and signs depends on the progression of the pathologic changes and the compensatory power of the heart. Engorgement of the lungs leads to decreased vital capacity and dyspnea. Fatigue after slight exertion appears with diminished cardiac output. Hemoptysis occurs as a result of rupture of pulmonary capillaries. Cough develops due to pulmonary congestion or, in some cases, to encroachment on the left main bronchus by the enlarged left atrium. Cerebral, visceral or peripheral embolism may result from a fragment of a left atrial thrombus breaking free into the systemic circulation. It is of extreme importance to realize that compensation may be so effective that a patient may have no, or minimal, symptoms even though the stenosis is far advanced. Such patients may, at any time, develop rapidly progressive symptoms and die in a short time.

Indications for Mitral Commissurotomy

There is a great difference of opinion among various surgical groups as to the selection of patients for mitral commissurotomy. One school contends that the ideal candidate for the operation is one with dynamically significant mitral stenosis who has as yet suffered no disability and who has none of the present contraindications to such surgery. That the lesion is dynamically significant is indicated by the presence of a dilated left atrium and increased pulmonary vascular markings on fluoroscopy. Cardiac catheterization in these cases demonstrates a rise in pulmonary capillary pressure or a fall in cardiac output on exertion. If such a patient is operated on before clinical symptoms develop, the outlook is very good. To wait may spell disaster, because the condition is already far advanced when symptoms appear.

A second school of thought on this subject is that the ideal candidate for surgery is one whose symptoms are urgent. His disability is progressive with increasing dyspnea on effort, easily provoked hemoptysis, chest pain and pulmonary edema. His outlook with medical therapy alone is hazardous.

Between these two extremes there is the compromise view that the ideal group for surgery comprises those cases of dynamically significant mitral stenosis where early symptoms have made their appearance and before the development of progressive congestive heart failure. Our experience has led us to subscribe to this point of view. Operation, we are certain, offers these patients an increased life span with a relatively small risk. They are infinitely better able to withstand the procedure than are those for whom surgery is an urgent necessity. With a good surgical result they may be spared the discomfort and disability which would eventually appear were the stenosis to go unrelieved.

The majority of the patients now referred for surgery unfortunately do not come into this category. Most of our patients have had evidence of progressive or advanced heart failure. Although these cases are not as favorable risks as the former group, excellent results may still be obtained, provided there are no contraindications to surgery.

Contraindications to Surgery

1. *Active rheumatic fever*—Active rheumatic fever is generally accepted as a definite contraindication to surgery. Rheumatic activity may be diagnosed with assurance only when overt rheumatic manifestations are present or when there is evidence of acute endocarditis, myocarditis or pericarditis. In the absence of these findings, subclinical rheu-

matic activity cannot be excluded clinically in any case, since present laboratory procedures are not sufficiently accurate for this purpose. Histologic study of specimens of the left auricular appendage removed at operation shows a high incidence of Aschoff bodies (about 25 to 30 per cent) in cases thought to be inactive. The danger of reactivation of a dormant rheumatic state is always present, and we have had several cases in which operation was followed by a flare-up of acute rheumatic fever. It may be significant that all of these patients were in the age group of 20 to 30 years.

Several times we have been confronted with the problem of operating on children with mitral stenosis. Such cases have been done in other institutions. We have had the opportunity of following very closely a large series of cases of rheumatic heart disease in children, because the New Jersey State Rheumatic Fever Clinic is held in our hospital. In our experience congestive heart failure due to mechanical obstruction at the mitral orifice has not occurred in the absence of active rheumatic fever in any child below the age of 15 years. Furthermore, in this age group there is a greater possibility of future recurrent episodes of acute rheumatic activity with danger of re-stenosis of the mitral valve. Consequently we have refused to accept for commissurotomy patients below the age of 15 years. The youngest patient in our series of operative cases was 21 years of age. This patient had a flare-up of rheumatic activity postoperatively.

2. *Subacute bacterial endocarditis*—Subacute bacterial endocarditis must be considered a deterrent to surgical therapy. The risk of loosening a shower of infected material into the systemic circulation is obvious. Most cases of subacute bacterial endocarditis are amenable to antibiotic therapy, and surgery should be postponed until the infection is eradicated.

3. *Associated valvular lesions*—Pure mitral stenosis is the ideal indication for commissurotomy. When mitral stenosis is complicated by other left-sided valvular lesions of dynamic significance, surgery is usually contraindicated. Between these two extremes lies the group of cases in which mitral stenosis is associated with mitral insufficiency, aortic insufficiency or aortic stenosis which is of little or no dynamic significance at the time. In these cases worthwhile improvement following commissurotomy may be expected. Perhaps the majority of cases of mitral stenosis referred for surgery comprise this group, and the correct assessment of these cases is one of the most important responsibilities of the medical team.

a. *Mitral insufficiency*—Contrary to former teaching, pure mitral stenosis does occur not infrequently. The technic of commissurotomy is based on the fundamental premise that the valvular stenosis may be corrected without producing insufficiency. In the presence of marked insufficiency preoperatively, little or no benefit may be anticipated from relief of the stenosis unless the insufficiency also can be corrected at the same time. However, in the presence of a slight degree of mitral insufficiency without dynamic significance, excellent results may be obtained. Indeed, in an occasional case in which slight insufficiency is present, following freeing of the commissures, valvular function improves and competency may be restored.

The presence of a systolic murmur at the apex in itself is insufficient evidence of mitral insufficiency since in some of these cases regurgitation cannot be demonstrated during surgical exploration of the left auricle. Moreover, in other cases in which a systolic murmur was not audible, at operation definite regurgitation could be proved.

The major criterion of the dynamic significance of mitral insufficiency is the presence of an enlarged left ventricle. The radiographic demonstration of an enlarged left ventricle in the presence of a coincident right ventricular hypertrophy may be most difficult, since the right ventricle may displace the left ventricle to the left and posteriorly. Important differential points are the dropping of the cardiac apex in the postero-anterior view and the position of the interventricular notch in the left anterior oblique view, along with obliteration or encroachment on the

cardio-spinal-diaphragmatic angle. A minor degree of left ventricular enlargement in the presence of mitral insufficiency is not considered a contraindication to surgery. It must be remembered that the left ventricle may become enlarged in cases of mitral stenosis without any organic insufficiency when an active carditis is present. The only means of differentiating these two etiologic factors is repeated fluoroscopic examinations, which in cases of activity will reveal significant variations in the size of the left ventricle within short periods of time, in the absence of decompensation. The assessment of the degree of left ventricular enlargement, therefore, requires judgment which can be acquired only by wide experience. Such experience can be gained only by study of a large series of cases preoperatively, at operation and postoperatively.

Auxiliary aids in arriving at a decision as to the degree of insufficiency of the mitral valve are the size of the left auricle and the electrocardiographic pattern. A giant left auricle rarely occurs in mitral stenosis unless there is an associated high degree of insufficiency, and the larger this chamber appears the more likely it is that significant mitral insufficiency is present. Theoretically, mitral regurgitation should cause systolic expansile pulsation of the left auricle, but in our hands this sign has not been of practical value. The electrocardiographic pattern is of considerable importance. We hesitate to accept a patient for surgery when the electrocardiogram does not show right axis deviation. Any case showing evidence of left ventricular strain electrocardiographically should not be passed for surgery.

Intracardiac catheterization in our laboratory has not enabled us to demonstrate mitral regurgitation reliably.

b. *Aortic insufficiency*—Dynamically significant aortic insufficiency, as documented by left ventricular enlargement, peripheral manifestations, and electrocardiographic evidence of left ventricular hypertrophy, constitutes a definite contraindication to mitral commissurotomy. However, a slight degree of aortic insufficiency evidenced only by a blowing diastolic murmur without greater than minimal left ventricular enlargement, in the presence of a small arterial pulse pressure and right axis deviation in the electrocardiogram, in a patient with severe symptoms due to his mitral stenosis, does not contraindicate surgery on the mitral valve. Theoretically, enlarging the narrowed mitral orifice will allow a greater flow of blood into the left ventricle and therefore may tend to make the aortic insufficiency worse. Whether this actually happens we do not know at this time. However, the patient may be relieved of his immediate symptomatology and may enjoy many years of fruitful life before progressive aortic insufficiency causes the left ventricle to fail.

It is possible that in some cases in which a diastolic blow is heard to the left of the sternum, without other evidence of aortic insufficiency, we may be dealing with the Graham Steell murmur of pulmonary valve incompetency. However, in our series in every instance in which there was a diastolic murmur at Erb's point, this murmur persisted postoperatively and therefore may be considered of aortic origin.

c. *Aortic stenosis*—At present we are of the opinion that aortic stenosis is a definite contraindication to surgery. Patients with this lesion are notoriously poor risks for any type of surgery, let alone a major procedure on the heart. Furthermore, correction of mitral stenosis without relief of constriction at the aortic orifice must of necessity place a greater burden on the left ventricle. It is hoped that in the future technics may be developed which will allow a surgical attack on both the aortic and mitral valves at the same operation. Although such operations have been performed recently, it is still too early to assess the results.

4. *Marked cardiac enlargement*—Marked cardiac enlargement is, as a rule, a contraindication to surgery since little benefit can be expected in those who survive the procedure. The myocardium is damaged to such an extent that even if the slight reserve it maintains is great enough to carry the patient through the procedure, it is insufficient to allow significant lasting benefit. However, in an

occasional patient in congestive failure the dilatation of the heart may be partially reversible. If vigorous therapy is successful in causing a considerable decrease in the size of the heart with improvement of symptoms, the patient may then fall into the group of acceptable risks.

A small number of patients with markedly enlarged hearts, in whom the mitral stenosis is the chief cause of the difficulty, occasionally have responded to surgery in a satisfactory manner. Therefore, marked cardiac enlargement is not to be considered an absolute contraindication to surgery and each case must be evaluated on its merits.

5. *Intractable heart failure*—Congestive heart failure which does not respond to optimal therapy is an obvious contraindication to surgery.

6. *Poor emotional outlook*—A poor emotional outlook on the part of the patient toward the operation must be considered a contraindication. Patients who are emotionally unstable and excessively apprehensive are, in our experience, definitely poor risks. We make it a rule never to attempt to urge the operation on a reluctant patient. Preoperative psychiatric evaluation ideally should be carried out on all patients.

7. *Coexistent heart disease*—The problem of operating on patients with mitral stenosis above the age of 50 years has arisen several times in our experience. The oldest patient whom we accepted for operation was 53 years of age. It must be kept in mind that the span of life has increased in recent years and it will probably be further prolonged in the future. Therefore, a patient in the older age group who presents symptoms and signs of mitral stenosis which limit his activities and immediately endanger his life should be considered for surgery. In this age group coexistent hypertensive or coronary artery disease must be considered contraindications to surgery. Coexistent hyperthyroidism and syphilitic heart disease also contraindicate mitral valve commissurotomy.

Other Considerations

Auricular fibrillation is not a contraindication to surgery. Indeed, a large percentage of patients with a normal sinus mechanism develop auricular fibrillation postoperatively, without apparently affecting a favorable result. We have made no attempt to abolish auricular fibrillation with quinidine either preoperatively or postoperatively.

A history of previous embolism is not a contraindication to surgery; on the contrary, we believe such an event actually makes surgical intervention more urgent. The 3 to 5 per cent postoperative incidence of embolism is more than counterbalanced by the risk of allowing the disease to pursue its natural course. It is hoped that by relieving stasis in the atrium and by excising the auricular appendage the chance of future embolism may be averted.

The majority of cases of mitral stenosis show evidence of pulmonary hypertension on cardiac catheterization. However, we have had the experience of finding normal pulmonary artery pressures on catheterization, despite the presence of a significant degree of anatomic stenosis of the mitral valve. Therefore, a normal pulmonary artery pressure does not contraindicate the performance of commissurotomy.

Case Reports

Case 1—This 39 year old woman had had scarlet fever at the age of 9 years. She was well until the age of 35 when she had her first bout of hemoptysis and complained of pain in the left side of the chest. Shortly afterward auricular fibrillation occurred and was followed by congestive heart failure. At the time of her admission to the hospital she was in congestive heart failure. Studies revealed the presence of a high grade mitral stenosis. Operation was advised but was delayed for various reasons. During this period of delay the patient suffered embolization of the right femoral artery. Immediate embolectomy followed by adequate anticoagulant therapy was not successful in restoring the circulation and it was necessary to perform a mid-thigh amputation. Four months following this event a mitral commissurotomy was successfully performed. The mitral orifice was found barely

to admit the exploring fingertip. The postoperative course was uneventful. At present, 4 months postoperatively, there are no signs of cardiac failure and she awaits the fitting of a prosthesis prior to increasing activity.

Comment—It is entirely possible that had this patient been subjected to surgery at the time when it was first advised, embolism with the subsequent amputation of her leg would not have occurred. The unfortunate experience of this patient indicates that sometimes mitral commissurotomy might prove, in retrospect, to have been an emergency procedure.

Case 2—This patient was a 27 year old woman who had had chorea at the age of 6 years and scarlet fever at 8. When she was 18 she was told that she had a heart murmur. She had no symptoms of cardiac insufficiency until a year prior to admission when she began to notice slight dyspnea on exertion. Despite this symptom she was able to continue working in a factory. Examination disclosed the classic signs of mitral stenosis. At operation far-advanced stenosis was discovered; the valve orifice barely admitted the fingertip. The postoperative course was uneventful and she has achieved an excellent result.

Comment—This patient, preoperatively, had only minimal symptoms, yet far-advanced disease of the mitral valve was demonstrated anatomically. It is felt that she has been spared progressive invalidism and has been returned to a long period of productive activity as a result of her mitral commissurotomy.

Case 3—This 37 year old woman had her first attack of acute rheumatic fever at the age of 17 years. She was asymptomatic until 3 years prior to admission when congestive heart failure supervened. On examination the classic signs of mitral stenosis were elicited and, in addition, there was a systolic blowing murmur at the apex, thought to be due to coexistent mitral insufficiency. At operation a tight mitral stenosis was found; there was also a strong regurgitant jet. The lateral commissure was incised, relieving the stenosis to a significant degree. At this point it was found that the valve leaflets could close properly and the regurgitant jet disappeared. The postoperative course was uneventful.

Comment—The experience in this case indicates that mitral commissurotomy may sometimes be effective in the relief of associated regurgitation. This is particularly true when the stenosis is eccentric. Freeing of the valvular line of closure allows proper function and may restore the competency of the valve.

Case 4—This patient was a 43 year old woman. She was first told that she had heart disease 4 years ago. During the past 4 years she has had chronic congestive heart failure and during the past month her symptoms became progressively worse. Classic signs of mitral stenosis were noted on physical examination and, in addition, there was a systolic apical murmur suggestive of mitral insufficiency. On fluoroscopy the heart was seen to be considerably enlarged but there was no definite evidence of gross left ventricular hypertrophy. Initially she was considered to be a very poor risk and was rejected for surgery. However, the patient pleaded so persuasively that something be done for her that it was decided to give her every possible chance. After several weeks of intensive therapy her congestive failure was brought under control. After re-evaluation of her case, she was accepted for surgery. Operative exploration revealed a markedly tight mitral stenosis without any evidence of regurgitation. A successful commissurotomy was performed. Postoperatively and to date, 9 months later, she has exhibited an excellent response. She has remained free of evidence of congestive heart failure and has resumed normal activity while under medical supervision.

Comment—This patient had marked cardiac enlargement and was in chronic heart failure. Nevertheless the results of surgery were excellent. Adequate preoperative and postoperative care played an exceedingly important role in achieving this result. Apparently in spite of the dilatation of the heart and failure she had a sufficient myocardial reserve.

Case 5—This 32 year old man had his first attack of rheumatic fever at the age of 5 years. Symptoms of heart disease became manifest at the age of 15. For the past 2 years he has been totally incapacitated and has spent most of his time in hospitals. Examina-

tion at the time of admission to this hospital disclosed the presence of mitral stenosis, possible mitral insufficiency and aortic insufficiency, with slight enlargement of the left ventricle. Exploration revealed a stenotic mitral valve which admitted only the fingertip. There was no demonstrable mitral insufficiency. A good valvuloplasty was performed without development of regurgitation. The patient did well for the first 4 months postoperatively, but since then he has had recurrent episodes of congestive failure and his heart has shown progressive enlargement.

Comment—This patient was submitted to mitral commissurotomy in the presence of an aortic valvular lesion. In spite of a technically good mitral commissurotomy his heart has become progressively enlarged while his clinical status has deteriorated. It is felt that the added burden of an increased blood flow to the left ventricle has caused this chamber to decompensate. This case demonstrates the fact that great care must be exercised in selection of cases for commissurotomy in the presence of aortic valve lesions.

Case 6—This patient was a 42 year old man. There was no past history of rheumatic fever. Five years prior to admission, symptoms of cardiac insufficiency developed and he was told that he had rheumatic heart disease. His symptoms were poorly controlled by treatment. Exploration revealed a slitlike stenotic mitral valve with partially calcified leaflets. Valvuloplasty was successfully accomplished with resultant good valvular function. The immediate postoperative course was uneventful. The apical diastolic murmur disappeared. The patient was discharged in good condition after 3 weeks and was instructed to attend the cardiac clinic. However, he did not return until 3 weeks after discharge from the hospital. He disclosed that he had resumed his normal manual work without any medical supervision. When readmitted he was in marked respiratory distress and died within 12 hours.

Comment—Although the patient may have had irreversible pulmonary vascular disease as a result of long-standing mitral stenosis, his rapid demise was undoubtedly the direct result of resuming, unreasonably, normal working activity without the restraints that good medical care would have dictated. It cannot be stated too strongly that in spite of corrective surgery, adequately performed, the patient should be considered as a continuing cardiac and managed as such for the immediate future.

Summary

1. Mitral commissurotomy should be seriously considered as a therapeutic measure for patients with dynamically significant and symptomatic mitral stenosis.

2. The underlying physiology of mitral stenosis determining the rationale for such surgery is outlined.

3. The indications and contraindications are briefly discussed.

4. Illustrative cases exemplifying certain considerations with respect to indications for and against surgery are described.

5. It must not be forgotten that surgical repair of the deformed valve is but an adjunct in the care of the rheumatic cardiac. These patients may be restored to great activity, enjoying a more normal life, yet they must, for the immediate future, be considered as cardiac patients under the continuing supervision of their physicians.

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The Neurogenic Bladder

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Neurogenic bladder is a broad term embracing many disturbances in bladder function. Today there is an increased incidence of this disorder. It is important to differentiate the neurogenic bladder from organic bladder disease. Once a diagnosis has been established, a set pattern of treatment can be started. A patient having a neurogenic bladder must be considered a lifelong patient subject to many late complications.

GREGORY S. SLATER

DISTURBANCE of the normal innervation to the bladder results in the syndrome known as the neurogenic bladder, which is characterized by one or more of the following:[1] (1) disturbance in the expelling force of the bladder (motor); (2) decrease in sensation of bladder fullness (sensory), and (3) disturbance of function of the external sphincter.

The symptom complex (neurogenic bladder) manifests itself by marked abnormalities in urination—poor urinary stream, sense of incomplete voiding, urinary retention and dribbling. These symptoms may also be the clinical manifestations of organic bladder disease or vesical neck obstruction, and differentiation must be made.

Etiology (Incidence)

The neurogenic bladder is a major problem in modern society, being a product of the increase in violent injuries in both civilian and military life. Auto accidents, industrial injuries and war wounds result in an increased incidence of the condition, as do congenital defects (meningocele, spina bifida) and neural diseases (tabes dorsalis, diabetic neuritis, pernicious anemia, multiple sclerosis, syringomyelia and poliomyelitis).

Anatomy and Physiology

Figure 1 illustrates the anatomy of the bladder, including the reflex arc of micturition. There are two muscles important in micturition: (1) detrusor, the muscle which gives the bladder its expelling force; the internal sphincter (vesical neck) is a muscular thickening of the detrusor at the bladder outlet, and (2) external sphincter, which, although not part of the bladder, is important in micturition. It is located distal to the prostate where it encircles the urethra. Constriction of this muscle aids in continence of urine.

An outline of bladder innervation is given in table 1: 1. The presacral nerve[2] (sympathetic), arising from L_2 to L_5, is not a single nerve but a plexus which lies anterior to the fourth and fifth lumbar vertebras between the iliac arteries. It then descends (meshing with the pelvic nerve) to form the pelvic plexus, lying on either side of the rectum and

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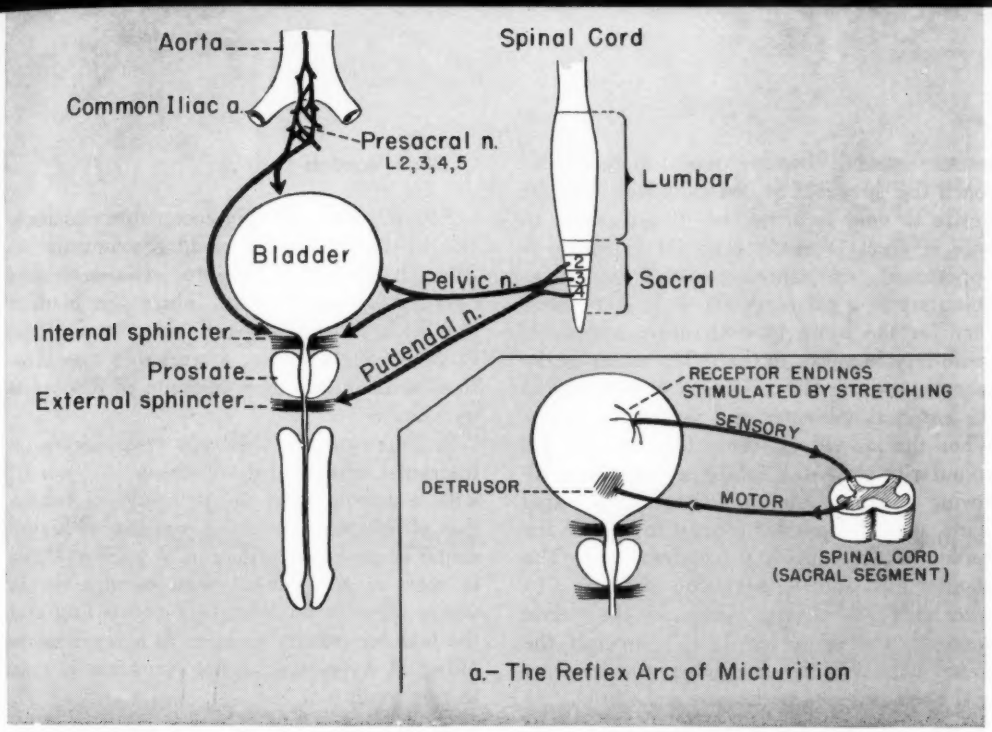

FIGURE 1. Bladder anatomy including the reflex arc of micturition.

proceeding to the bladder. This nerve supplies motor fibers to the internal sphincter and carries sensory impulses from the trigone and posterior urethra. The presacral nerve is not important in micturition.

2. The pelvic nerve[3] (parasympathetic) arises from S_2 to S_4, joining with the sympathetics to form the pelvic plexus. This nerve is an important one, carrying motor (constricting) fibers to the detrusor and "picking up" sensory impulses (sensation of bladder stretching or filling).

3. The pudendal nerve (spinal) arises from S_2 to S_4; stimulation of this important nerve causes constriction of the external sphincter.

Physiology of Micturition[6]

As Munro has stated, "Micturition is a process of inhibition rather than one of facilitation." Micturition is the reflex response of the muscle fibers of the detrusor to stretching, the reflex center being located in the sacral portion of the spinal cord. As the bladder distends, its natural response is to expel its contents. This action is prevented by subconscious inhibitory impulses from the brain. As the bladder further fills and is distended, the

TABLE 1

OUTLINE OF BLADDER INNERVATION

NERVE	SYNONYM	RESULT OF STIMULATION	ORIGIN
1. Presacral (Sympathetic)	Hypogastric	Contraction of the internal sphincter. This is not important to micturition	L_1 to L_2
2. Pelvic (Parasympathetic)	Nerve	Contraction of the detrusor. Carries sensory fibers which convey the sensation of bladder filling	S_2 to S_4
3. Pudendal (Somatic)	Pudic	Contraction of the external sphincter	S_2 to S_4

The old idea of antagonistic control of bladder innervation,[4] i.e., that the parasympathetics were both motor to the detrusor and inhibitory to the internal sphincter and that the sympathetics were inhibitory to the detrusor and motor to the internal sphincter, has been discarded on the basis of subsequent work.[5]

sensory stimuli become more marked and reach the threshold of consciousness, and the desire to void is perceived. If the desire to void is great (and the time for urination is opportune), micturition passes from an involuntary to a voluntary act. It is then necessary for the brain to send down additional inhibitory impulses to the reflex center in the sacrum, causing the voluntary contraction of the external sphincter and perineal muscles. When the individual wishes to pass urine he voluntarily stops the inhibitory impulses, allowing the detrusor to contract and expel urine. It is of academic interest to include the nerve pathways involved in micturition: The bladder fills, and the sensation of filling (1) is carried via sensory fibers of the pelvic nerve to the spinal cord, (2) ascends the spinal cord via the fasciculus gracilis tract to the sensory area of the cerebral cortex, (3) passes to motor area of cortex, (4) descends back down the spinal cord via the lateral corticospinal tracts, and (5) passes to the bladder via the motor fibers of the pelvic to contract the detrusor. At the same time the pudendal nerve is inhibited, allowing for relaxation of the sphincter.

Recently it has been shown that the mechanics of bladder emptying are more complex than mere detrusor contraction and external sphincter relaxation.[7]

When the bladder is to be emptied, the external sphincter relaxes, but in addition the muscles of the pelvic floor relax, particularly the pubococcygeus, thus permitting the proximal urethra and bladder neck to drop and, somewhat like a bucket, tip down. When the detrusor contracts it is helped along by an increase in intra-abdominal pressure voluntarily produced by splinting of the diaphragm and contraction of the anterior abdominal wall muscles.

Conversely, when the bladder contents are to be retained, the detrusor relaxes, the external sphincter contracts, and there is no voluntary increase in abdominal pressure. In addition, contraction of the pubococcygeus tightens up the pelvic floor, elevating the bladder neck and thus further increasing peripheral resistance.

Classification

There is no uniformly acceptable classification of the neurogenic bladder, primarily because it does not fall into well-demarcated types. After spinal cord injury the bladder may pass through several types, as depicted in figure 2. However, a workable classification based on the anatomic site of disease is as follows:

1. *Supraspinal*—This type results from intracranial disease (above the spinal cord), with a deficiency of the pathways of inhibition of urination, resulting in a loss of higher center control over urination. A good example is seen in the patient with hemiplegia in whom there is no inhibition of voiding and the bladder reflexly empties as a response to filling. A hypertonic cystometrogram is seen in this condition.

2. *Automatic*—In this type the neural reflex arc between the bladder and the spinal cord is intact. There is a disturbance of the neural pathways above the sacral cord resulting in a bladder which operates as a simple stretch reflex with no higher center control of emptying or inhibition. This would be noted in a complete transection of the cord above the level of the conus. It can also be seen in infants, who urinate reflexly because of underdeveloped central control. A slightly hypertonic cystometrogram is seen.

3. *Autonomic*—In this type the neural reflex arc between the bladder and the spinal cord has been interrupted, placing the bladder "on its own," independent of external neural control. The emptying reflex is absent; the bladder fills, overdistends and empties by overflow. A normal cystometrogram is seen.

4. *Sensory type*—The sensory side of the bladder reflex arc is interrupted in this type. As a result the patient loses bladder sensation and is unable to sense when his bladder is full. Overdistention occurs with subsequent damage of the bladder musculature. These patients end up with a flabby atonic bladder. This type is seen in patients having tabes dorsalis, multiple sclerosis, syringomyelia and pernicious anemia. An atonic cystometrogram is seen.

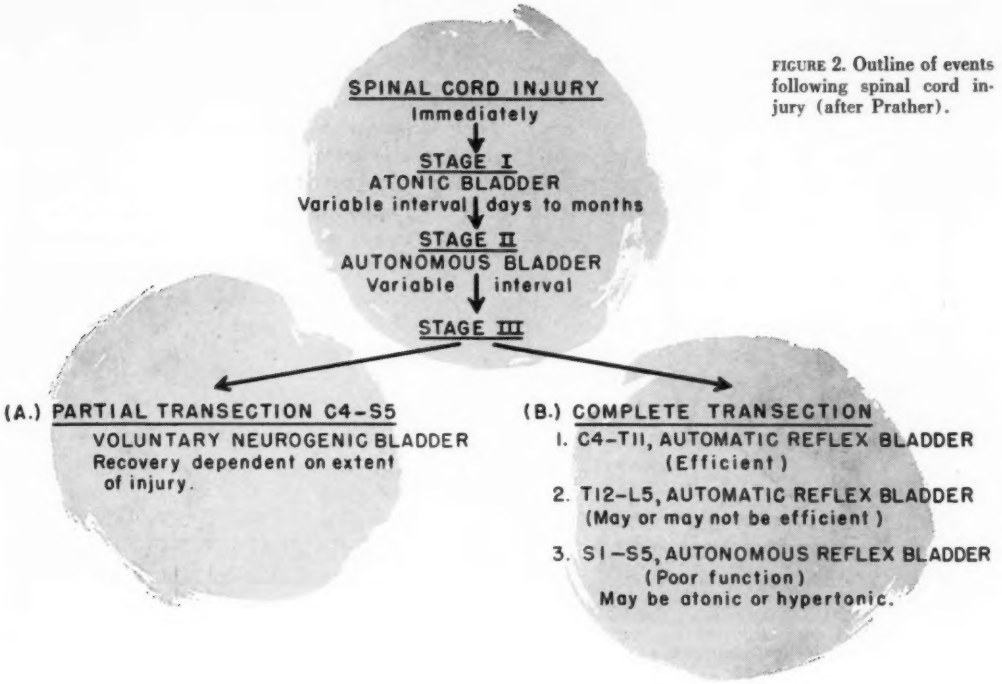
SPINAL CORD INJURY
Immediately
STAGE I
ATONIC BLADDER
Variable interval | days to months
STAGE II
AUTONOMOUS BLADDER
Variable | interval
STAGE III
(A.) PARTIAL TRANSECTION C4-S5
VOLUNTARY NEUROGENIC BLADDER
Recovery dependent on extent of injury.
(B.) COMPLETE TRANSECTION
1. C4-TII, AUTOMATIC REFLEX BLADDER (Efficient)
2. TI2-L5, AUTOMATIC REFLEX BLADDER (May or may not be efficient)
3. SI-S5, AUTONOMOUS REFLEX BLADDER (Poor function) May be atonic or hypertonic.

FIGURE 2. Outline of events following spinal cord injury (after Prather).

5. *Motor type*—In this type the motor side of the bladder reflex arc is interrupted. The sensation of bladder filling is preserved but the patient has lost his ability to empty his bladder. This type is seen most commonly in patients having poliomyelitis. An atonic cystometrogram is seen.

6. *Obstructive type*—This is not a true neurogenic bladder, but is included because it is seen so frequently and is so commonly confused with a neurogenic bladder. All the neural pathways of micturition are intact. There is a purely mechanical obstruction at the vesical neck, and it is very common in cases of obstructed prostate, obstructive prostatic neoplasm, bladder neck contracture or urethral stricture. In these cases the outlet obstruction causes damage to the bladder musculature beginning with trabeculations and terminating as an atonic flabby bladder, the result of prolonged overdistention. An atonic cystometrogram is seen.

Diagnosis

The outstanding clinical feature of the neurogenic bladder is incontinence, an inability to control the outflow of urine. However, to arrive at a definitive diagnosis requires thought and study. In the work-up, a system should be followed:

History—A routine history should be taken, including the patient's present urinary difficulty—frequency, diminished stream, incontinence—and inquiry as to recent and past operations, injuries and diagnostic procedures (myelograms, spinal taps, etc.). Inquire as to past history of urethral stricture, syphilis and diabetes mellitus.

Physical examination—This should include sensory and motor tract examination—paralysis, level of injury in traumatic cases, loss of external rectal sphincter tone, etc.

Residual urine—After the patient has voided, catheterize for residual urine. This will give information as to possible presence of urethral stricture as well as the amount of residual, or stagnant, urine.

Cystometrogram[8,9] (figure 3)—This is a record of intravesical pressure at intervals as the bladder is distended with fluid, giving in-

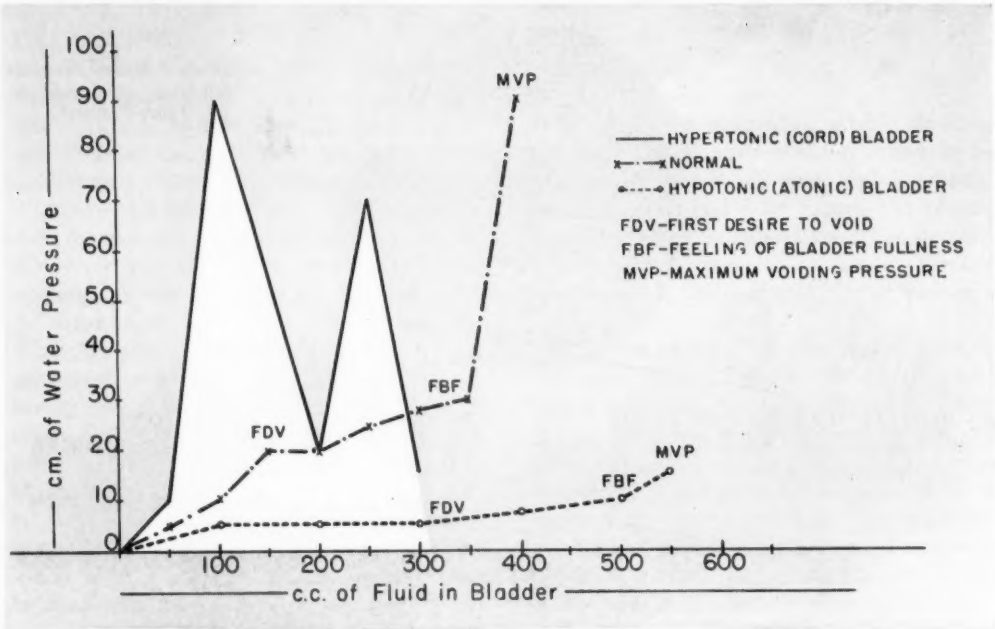

FIGURE 3. Representative cystometrograms.

formation as to the type of bladder (atonic, normal, hypertonic).

Sphincterometry[10]—This determines urethral resistance. The normal value is 20 to 30 mm. of mercury.

X-ray study. Excretory urogram—Appraise the condition of the upper urinary tract.

Cystourethrogram—Study the middle and lower urinary tracts. These x-ray examinations will aid not only in the immediate diagnosis but also in revealing possible complications of a neurogenic bladder—secondary hydronephrosis, ureterovesical reflux, bladder diverticula or urinary tract calculi.

Cystoscopy—This direct instrumental examination of the urethra and bladder is important in the complete work-up. Cystoscopic examination is often mandatory in the differential diagnosis of a hypotonic bladder caused by neural damage and a hypotonic bladder mechanically produced by an obstruction of the bladder outlet.

Treatment[11]

General measures—Treatment depends on the type and duration of the neurogenic bladder. Certain fundamental precepts bear repeating:

1. The fundamental proposition that intravesical pressure must exceed urethral resistance to permit evacuation of the bladder.

2. After an acute injury (figure 2), or insult as after spinal anesthesia, the bladder becomes functionally denervated and is unable to empty itself. During this emergency "expectant" phase, the bladder should be drained by urethral catheter to prevent overdistention and bladder musculature damage. If the period of catheter drainage is extended, tidal drainage should be considered.[12,13]

3. Catheters should be small (F16, F18) to minimize urethral trauma, and if indwelling they should be irrigated twice daily with saline and twice weekly with "M" solution to prevent incrustations.[14]

4. It is impossible to prevent infection of the urinary tract in the presence of catheters. To limit infection, GANTRISIN® (0.5 gm. three times daily) can be used. Acute episodes of infection should be treated with the specific antibiotic (determined by sensitivity studies) for that particular infection.

5. The goal in the treatment of a neurogenic bladder is to establish conditions as near normal as possible, i.e., no incontinence, no residual urine, no urinary tract infection and no dysuria. This goal is never reached, but good treatment enables one to get as near to it as possible.

Specific measures. Uninhibited type—This type with its uninhibited, frequent bladder contractions is frequently benefited by parasympathetic inhibitors as tincture of belladonna or BANTHINE®.

Automatic type—Some persons with this type eventually acquire a perception as to when the bladder is going to empty and then can reach a toilet in time. Patients in this category, as well as those who develop "trigger areas" which can be stimulated so as to empty the bladder, require no therapy. If the bladder is spastic and has a poor capacity, a sensory block or neurotomy should be considered.[15]

Autonomic type—To reduce the residual urine in these cases try instructing the patient on use of manual suprapubic compression; URECHOLINE® can be tried. If these simpler measures fail, attempt to alter the balance between intravesical pressure and peripheral urethral resistance by pudendal nerve block to relax a spastic exterior sphincter, or by transurethral resection of the vesical neck.[16]

Sensory type—In the early stages, employ catheter drainage to prevent permanent damage to the bladder musculature, and Urecholine to increase bladder tone. In later stages the big, flabby vesical "bag" creates a major problem. Transurethral resection of the vesical neck is often helpful, as is subtotal cystectomy. Some of these patients will require a permanent catheter, preferably perineal or cystostomy type.

Motor type—Catheter drainage. In later stages, if improvement does not occur, it will progress to type 2, 3 or 4 and can be handled as such.[17]

Obstructive type—This is the most satisfactory type to treat. In some cases the immediate temporary management will consist first of a cystostomy or catheter drainage. Later the peripheral obstruction is removed. Dilate strictures, surgically remove obstructive prostatic tissue, and treat an obstructing prostatic neoplasm with hormone therapy and surgery as indicated.

Complications and Prognosis

One with a neurogenic bladder must be considered a lifelong patient and never be discharged from observation. Experience has shown that this condition has a poor prognosis as far as late complications and longevity are concerned.

The outstanding complication is infection of the bladder with subsequent pyelonephritis and renal damage. Other complications are urinary tract calculi, ureterovesical reflex (most common with autonomic bladders), periurethral diverticula and fistulas, as well as decubitus ulcers.

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Tidal Irrigator

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The irrigator described is positive in action and simple to operate. During siphonage the bladder empties first, then the container. With a continuous indwelling catheter, as used for paraplegics, tidal irrigation keeps the bladder practically free from infection. If the patient is unable to void after an operation, tidal irrigation will shorten the period of disability.

O. A. NELSON

SEVERAL conditions can be improved or corrected by the use of a tidal irrigator. Irrigation of the bladder with a suitable solution will clear up infection sooner than medication without irrigation. Irrigation can help increase the capacity of some types of contracted bladder. If a patient is unable to void after a pelvic or an abdominal operation, the period of disability can be shortened by the use of tidal irrigation. In certain types of permanent transverse myelitis, automatic bladder can be established if tidal irrigation is used early in the disease. Also, whenever a bladder must be evacuated by artificial means, tidal irrigation aids in controlling infection.

Although many of the benefits of tidal irrigation have been recognized for a number of years,[1] the lack of a positive, readily adjustable irrigator has caused some physicians to hesitate or omit to institute this procedure. Usually, tidal irrigators have been improvised from odds and ends at hand rather than specifically designed and built for the purpose.

In order to function satisfactorily, the tidal irrigator must be so constructed that when siphonage occurs, the bladder empties before the apparatus does. Otherwise, some fluid will remain in the container at the end of siphonage. Such residual fluid, which often contains bacteria, might thus re-enter the bladder.

In my original tidal irrigator,[2] the outflow from the container was retarded and the reflux obviated by a constricting place in the outlet arm of the U-shaped tube. This instrument was positive in action because of the principle devised by Richards.[3] The siphon was an inverted U-shaped metallic tube about 12 inches long, placed inside a glass container. When the fluid ascended to a certain point, this tube became partly submerged, and siphonage was activated. Although this apparatus functioned very satisfactorily, blood clots, mucus or debris at times clogged the outflow at the constricted area. Occasionally, the irrigator had to be dismantled to dislodge the obstruction. Another objection to this apparatus was that when the obstruction occurred, the overflow drained on the floor.

A new apparatus (figure 1), similarly constructed, has been devised to overcome both of these objectionable features. Any obstructing material can be readily removed. If ob-

struction occurs, the overflow drains into the waste container.

Situated in the center of the new instrument is a pipe (D), called here the "central pipe," which serves several purposes. One inch below the glass container, the outlet arm of the inverted U-shaped tube (B) is connected to the central pipe. A piece of metal (I), concave on one side and convex on the other, the "sluice gate," fits with its convex surface over the opening between the outlet arm of the inverted U-shaped tube and the central pipe. On this surface there is a groove, 2 by 2 mm. (J), for the flow during the siphonage. A stud (G) through the central pipe holds the gate against the opening. Attached to the gate is a rod extending to the top of the central pipe. When clogging occurs, the gate can be lifted to allow free flow of fluid. If necessary, it can be removed and cleaned. The central pipe, which has a screw thread at the top and is soldered to the bottom, holds the two ends of the instrument against the glass cylinder. Therefore, this instrument is sturdier than the one held together by only the inverted U-shaped tube.

For this type of irrigator to function well, two air vents are essential: one below the constriction and the other above the fluid level. Since one side of the sluice gate is concave, the area below the constriction is vented through the pipe. A hole in the central pipe above the U-shaped tube serves as a vent above the fluid level. This opening in the pipe also takes care of the second objectionable feature in the old apparatus. In case of obstruction, the overflow goes through the opening and down the central pipe into the waste container. To set up the apparatus, rubber tubing is connected from drip bottle to tube (E), from catheter tube (F) and from (H) to waste container. The instrument can be placed so as to obtain any desired distention of the bladder.

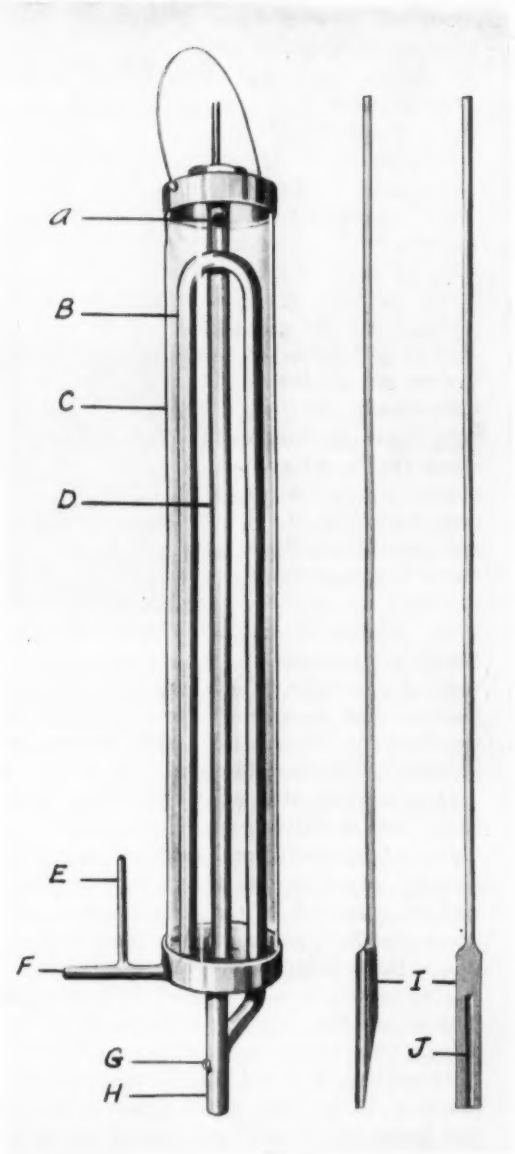

FIGURE 1.

A. Hole in pipe
B. Inverted U-shaped tube
C. Exterior container, a glass tube
D. Central pipe
E. Connection for irrigating solution
F. Connection for catheter
G. Set screw, to position sluice gate
H. Connection for waste container
I. Sluice gate and stem
J. Groove in sluice gate

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Burns Treated By An Open Method

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A report is made of 352 severely burned patients treated successfully by an open method. The treatment employed is described. The various complications encountered, as a result of or coincident with the burns, are listed and discussed. There were only 4 deaths in the series; the factors contributing to the low mortality are presented. It is emphasized that successful treatment of severely burned patients is dependent to a large degree on full understanding of underlying pathology.

G. KENNETH LEWIS

TREATMENT of the burned patient begins immediately after injury and in many instances is not concluded for years, or even during the life of the individual. With recent developments in therapy, we may see more deformities and blemishes because of reduced mortality. These are less serious, however, and are amenable to eradication or improvement because of advancement in methods of plastic restoration.

Disagreement still exists regarding both initial and definitive care. This is based on failure of physicians and surgeons to recognize the importance of underlying pathology and on a laxness in the differentiation between superficial lesions and complete destruction of the full thickness of the skin.

This report is a resume of 352 severely burned patients, all in the author's service in a large burn center in the European Theater of Operations in World War II and in private practice. All of these patients had third degree burns with 5 to 84 per cent of the body surface involved. They were treated by an open method. The time interval from injury to arrival at the hospital ranged from a few minutes to several months. On admission, some patients were in various degrees of shock, dehydration, infection, malnutrition and ulceration. Their dressings varied from dirty, odorous and filthy to clean, dry and comfortable.

Of the 352 patients, 133 (35.9 per cent) were given whole blood transfusions; 196 (52.9 per cent) received plasma; some received both. For shock and maintenance, 203 (56 per cent) were given glucose 5 per cent, and 66 (18.4 per cent) were given saline. During the acute stage, at least one, at the most 11 (an average of five and one-half), transfusions were given to those 133 patients requiring blood.

There were only four deaths in this series. The low mortality, in the author's opinion, can be attributed in large measure to the following important contributing factors which should be incorporated in the management of all serious burns:

1. Trained personnel thoroughly skilled in the technic and methods of burn therapy.

2. A well integrated plan of treatment from emergency care to transition of the dirty wound to a clean wound, to final definitive care and skin grafting.

3. Constant, patient, personal supervision of the patient and participation in a goodly

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portion of the actual, often tedious work of treating the seriously burned; attention to details, such as checks on important laboratory data and blood transfusions.

4. Realization that cognizance of underlying pathology and a knowledge of the sequence of healing are prime requisites in determining successful burn therapy.

5. Prevention of shock, insofar as possible, by careful restoration of blood volume, sodium and water as soon as possible.

6. Use of tried methods and remedies, rather than the testing of new agents and technics on the acute burn. The more important consideration is not what should be put on a burn but rather what should *not* be applied to a thermal wound.

7. Delay of skin grafting until the burn wound is ready to accept the graft, regardless of some current reports in the literature which advocate immediate grafting.

8. Correlation of topical therapy and general care of the acutely burned patient with simultaneous attention to associated injuries.

Etiologic factors in this series were: flame, 86.64 per cent; chemical, 7.04 per cent; scalding water and steam, 1.68 per cent; contact with hot stove, 0.28 per cent; electrical contact, 0.56 per cent; hot grease, 0.28 per cent and roentgen ray, 0.28 per cent.

There were associated injuries in 13.16 per cent of the patients: chest and abdominal injuries; loss of arms, digits and legs; fractures; rupture of tympanic membranes; eye injuries; burns of the mucosa of nose and mouth, and foreign bodies. In this group the number of injuries is only approximate, because in some they were unrecognized; in others, presumed but never demonstrated.

Area and depth of a burn is important in the anticipated treatment. In our series, the method described by Berkow[1] was used in estimation. A patient with a burn of 10 per cent or more of body surface will probably suffer from shock; a patient with a burn area of 25 per cent or more will suffer from fatal shock unless prompt and active treatment is given. Pulse and blood pressure is taken every hour for the first 24 hours, or more often if the area is large and believed to be deep. However, in many patients the distribution of burns makes taking blood pressure impossible because of the area involved.

If blood volume has been reduced to a critically low level, the blood pressure will suddenly become dangerously low without rise in the pulse rate. Hematocrit, hemoglobin and red blood cell determinations are excellent guides to the possibility of impending shock. These determinations, taken at 2 or 3 hour intervals, are usually sufficient. In an acutely burned patient, the primary reading may be assumed to be the normal, and variation from this reading can be assumed to be a change in the individual's condition.

Plasma protein determinations performed serially provide valuable information. Occasionally, a falling plasma determination will be the only indication of impending shock.

Urinary output is a useful and quite accurate determination of the condition of the circulatory system, as the urinary excretion may be markedly reduced at a time when blood pressure and pulse are normal. If the output is reduced, a circulatory failure may be anticipated.

Shock in serious burns is caused by the large loss of plasma, red blood cells and vascular elements through the damaged capillary walls into the tissue spaces, and develops rapidly in a severely burned patient. Primary shock is frequent where injury has been so severe that death is inevitable, or may quickly supervene, unless proper treatment is instituted at once. Symptoms develop as soon as the injury is received, with the onset of pallor, perspiration, chills and sometimes loss of consciousness. The pulse rate is increased, and the early blood pressure reading may be normal or slightly increased.

Secondary shock is usually encountered in the severely burned patient, but with little or no change in the pulse or blood pressure after injury. In a few hours, however, symptoms develop, with a fall in blood pressure and increased pulse rate. Recovery from primary shock may be quite prompt, or the secondary type may develop.

The shock to be feared is that produced by a decreasing circulatory plasma volume. In

fully developed shock, whole blood transfusions are the most valuable expedient to increase the blood pressure and supply the oxygen-carrying cells.

Open Method of Treatment

The patients in the series reviewed here were treated according to the procedures to be described. Emergency hemoglobin and hematocrit tests were made at 2 to 3 hour intervals, and blood pressure readings taken every hour until shock was controlled. Routine blood counts and urinalyses followed. Blood plasma infusions were begun and continued until adequate amounts were given. The method of Harkins, Lam and Roemmce[2] was used in estimating the amount of plasma to give. This is a simple and quite adequate method for most purposes; i.e., 100 cc. of pooled plasma are administered intravenously for every one point rise above a normal 45 hematocrit for a 68 kg. adult. Proportionately smaller amounts are administered for children. Another simple first aid rule is one pint of plasma for each 10 per cent of surface burned.

If the patient's condition permitted, clothing was removed immediately. The patient was placed on a sterile field, the affected areas were adequately draped, and the remainder of the body was covered for warmth and comfort of the patient. The dressing room was evenly heated to approximately 75° to 80° F. The surgeon and assistants underwent a surgical scrub and wore caps, masks, sterile gowns and gloves. The patient and circulating nurses were also masked. The wound was gently cleansed with soap and water, and loose devitalized tissue removed.

If clothing was adherent, it was soaked off in a bathtub of clean water, maintained at approximately 105° F. This procedure is relatively painless if the patient has had adequate amounts of morphine. After the clothing and debris were removed, the patient was then given his final dressing.

He was placed on a sterile stretcher, table or bed, and final cleansing was begun. Hair about the wound was removed by shaving. This applies especially to burns of the face and head, since hair of the head and whiskers permit incorporation of foreign material, wound secretions, perspiration, and so forth, into the burned area.

The burned areas and the clothing were more or less sterile from the heat. Grease and other substances which had soiled the area sloughed off with superficial epithelium in a few days at most. Our main procedure was to transform the lesion into a clean wound with soap and water, without trauma to the tissues, and to irrigate the wound frequently. Chemical burns required the proper neutralizing agent to prevent further action on the tissues. Solvents of hydrocarbons were used with caution for this purpose. Blisters were merely punctured near the periphery and left to disintegrate spontaneously.

After the injured surface was cleansed, it was dressed as simply as possible, using fine mesh gauze impregnated with petrolatum. The gauze strips were made up in lengths of 12 to 15 inches and 6 to 8 inches in width. Dry sterile gauze was then laid over the petrolatum gauze to a depth of 6 to 8 layers, with additional padding necessary to fix the part. Gauze bandage was used to fix the dressing in place. In caring for hand wounds, the hands were dressed in position of function with digits separated. In burns involving the trunk, care was observed to give the individual plenty of room to breathe.

Alleviation of pain is a vital problem in burns. Absorption of morphine is sometimes slow when administered subcutaneously; if the morphine is repeated, an overdose is possible as the general condition tends to improve. We have found there is an element of safety in the intravenous administration of morphine. The dosage is one-half the amount usually given subcutaneously; it is never given to a patient with a respiration below 12.

Plasma was given routinely except to patients with advanced shock and anemia. Whole blood transfusions by the citrate method were used for these two conditions.

In the dietary care, particular attention was paid to the caloric intake. A high protein diet was given, insofar as possible. Food was prepared to stimulate the appetite and

encourage the patient to take at least 3000 calories in 24 hours. Interval feedings were always available.

Fluid intake and output was charted for every patient. Measuring the urinary output was a most important check on the individual's progress. Sufficient fluid intake to maintain a minimum of 1200 to 1500 cc. of urine in 24 hours was found necessary, at a specific gravity of approximately 1.012 to 1.018.

Fluid intake in 24 hours required for water balance in normal people is approximately 3,650 cc. This is insufficient for a severely burned patient because of abnormal loss from hemorrhage, vomiting, diarrhea, fluid discharged from the denuded areas and sweating. Coller and his associates[3,4] determined that patients who are dehydrated immediately after a burn require an amount of fluid equal to 6 per cent of the body weight. Patients in our series were given 3,650 cc. of fluids plus 6 per cent of the body weight for a person of 75 kg., or 4500 cc., giving a total in some cases of 8,150 cc. in 24 hours.

For the military patients in the author's service in World War II, because of the emergent nature of the casualties, plasma rather than fluid administration was relied on.

Fluid deficits were made up parenterally if oral intake was insufficient. Difficulty was encountered in locating a vein which would carry the parenteral fluid, and cannulization was of little value because the vein would often start to carry the fluid and then collapse. Use was then made of the vena femoralis. This vein is easy to get into and saves the patient many trying moments. In the author's cases, the vessel was used daily for several days with no difficulty. In cannulizing this vein, we located the inguinal ligament which forms a ridge, passing from the anterior superior spine of the ilium to the pubic tubercle. The needle was inserted approximately perpendicular to the skin, midway between the superior spine and pubic tubercle, for a distance of about 3 to 5 cm. just distal to the inguinal ligament and medial to the artery.

In blast and explosive injuries, the eyes were always examined. Frequently eardrums were ruptured in this type of accident and foreign materials driven into the middle ear. The interior of the nose and mouth, extending to the pharynx, was sometimes found to be the seat of injury from heat. Blast injuries to the chest were also present, accompanied by puncture wounds with foreign bodies. The abdomen required and was given careful observation throughout the entire period of illness. Aside from penetration of foreign material, gastric and duodenal ulcers, hepatitis and/or other disorders frequently developed. Many patients had fractures, nerve injuries and intracranial foreign bodies.

The next step is the maintenance stage. In superficial burns, the original dressing may carry the patient to completion; but in deep burns, perspiration, body, bowel and bladder secretions, and in warm weather, maggots, may get into dressings. The mechanical removal of products of decomposition was accomplished in the author's cases by immersing the patient in a bath of hypertonic salt solution. This procedure was first suggested by Passavant,[5] later popularized by von Hebra,[6] and recently advocated by Blair and Brown.[7] The bath was utilized from 1 to 3 hours daily, followed either by dry, warm air treatment or simple dressings. Results in this series failed to demonstrate any dressing emollient superior to simple protective dressings of petrolatum gauze, boric acid wet dressings, or leaving the wound open to air.

The method described has the advantages of promoting drainage, cleanliness, removal of secretions and excretions, necessary debridement, and daily evaluation of wounds. Asepsis was maintained for prevention of cross infection. Hands of the attendants were scrubbed with soap and water, and rubber gloves were worn. All persons entering the room while tubs were in use were masked, including the patient. The outer dressings were removed before the patient entered the tub, leaving the inner part to be soaked off by the saline solution.

The bath was made comfortable by a sterile canvas strip fastened to each side of the tub, giving back support. The patient was encouraged to remove his own dressings and even-

tually became convinced that he was playing an important role in his daily treatment. Hot drinks and feeding were given during this procedure if the baths required considerable time. Even temperatures were maintained by a low stream of water continually running into the bath at a temperature of 105° F.

Active exercise can be started much earlier under water without producing pain, and since this therapy plays an important role, it was started as soon as possible.

After debridement and, frequently, dressings applied in the tub, the patient was returned to bed, and any indicated therapy was administered. This plan was carried out daily until the wound and the patient were ready for skin grafting.

In the series of 352 patients, 281 skin grafting operations were performed; 703 thick split graft and approximately 12 skin flap procedures. In preparation for grafting, the body chemistry approached as near normal as possible. This included blood proteins, chlorides, red and white blood counts, hemoglobin and urinalysis. The local preparation consisted of wet boric acid dressings, changed twice daily for three days, and sulfonamides and antibiotics when indicated.

Covering of the area at one operation is a frequent problem because the patient has been hurt badly, and at operation his condition may be good or critical, depending on amount of tissue loss. In patients requiring the maximum coverage with the minimum available skin, the skin grafts were divided into small, irregular squares and placed directly on the granulations. As each of these small squares grew, it spread out from its periphery to approach and join its fellow. This procedure was repeated until covering was complete.

If the granulations were clean and the patient's temperature normal before and after operation, dressings were undisturbed for approximately nine days. If any evidence of infection or drainage was present, there was no hesitation in dressing the patient in 48 hours. After the first dressing, wet dressings were again used if cellulitis or hematomas were present. If only part of the area was covered, the patient was again treated in the bathtub as previously.

Complications

Tracheotomy was performed on 2 patients for obstructed breathing; both recovered.

Failure of the graft to grow was encountered in 5 patients on first operation. One of these had a phosphorus burn requiring 3 operations before a partial take of about 50 per cent was obtained.

Anemia was a frequent complication, requiring repeated checks of the red blood count and hemoglobin. It was progressive in some patients; in others there was a drop from 4,000,000 red cells and hemoglobin of 80, to 1,850,000 and 50 per cent hemoglobin in a period of 48 to 72 hours. Some of the 133 patients requiring whole blood transfusions to maintain the blood at a desired level we treated on admittance, some during the period of treatment. Anemia tended to clear up as denuded surfaces were covered.

Kidney impairments included anuria, oliguria, azotemia, albumin, hemoglobinuria and casts. Two patients with anuria gave a history of being dressed with sulfonamide ointments and of oral sulfonamide intake. A blood level in one of these patients was 27 mg. per 100 cc.; in the other, 22 mg. per 100 cc., and crystals were demonstrable in the urine. The patients recovered on withdrawal of sulfonamide and administration of fluids. Two fatal cases developed complete anuria on the twentieth and twenty-fourth days.

Hepatitis occurred in 8 patients, with 1 fatality.

Duodenal ulcer was diagnosed in 3 patients. Medical care was instituted with apparent recovery.

One patient had severe frontal headache which persisted during the acute stage and convalescence. Investigation failed to reveal the cause.

Two patients had personality changes and were considered definite psychoneurotics requiring psychiatric help. This phenomenon was noted after the injury plus one and two operative procedures, respectively. The neuroses have persisted in both patients.

Amputations were necessary in 7 patients as the result of associated injuries.

Chest complications were divided into 2 categories: (1) those which required observation only, and (2) those which required actual therapy. Six patients developed pulmonary congestion and tracheobronchitis. They were treated symptomatically, and recovery was complete. Two patients developed empyema requiring drainage; closed drainage was used. Both patients recovered.

Perichondritis occurred in 4 patients who had burns of the external auditory meatus. The ears, on healing, were scarred, misshapen, and required reconstruction.

Scarlet fever developed in 4 patients. They were isolated and responded to administration of penicillin.

Two patients had eye injuries resulting in loss of the globe. One patient developed a panophthalmitis, with resulting enucleation of one eye, and scarring of the other eye from burns on the cornea. The other patient sacrificed his eye because of an intra-ocular foreign body followed by infection.

With all burns of third degree, hemorrhage, to some extent, will be encountered from various causes, such as dressings, erosions of blood vessels, infection, injudicious debridement, blood dyscrasias, and so forth. This bleeding usually is capillary, with the exception of the larger vessels. In 3 patients in this series, the hemorrhages were of the hands and were controlled by compression. In 1 patient, the mucous membrane of the nose was burned and the vessels of the septum and turbinals were eroded. In one fatal case, hemorrhage was from the burned areas and was never completely controlled.

In 15 patients, the tympanic membrane of the ear was ruptured, followed by an otitis media. Foreign bodies were driven into the canal, and extension of infection from the nose and throat or from the external meatus was considered the etiology.

Colostomy was performed on 4 patients who had penetrating wounds of the abdomen caused by foreign bodies.

Decubitus ulcers developed in 2 patients during the period of greatest catabolism. These ulcers developed on the coccyx and healed spontaneously.

There were 4 deaths in the series. One was caused by focal necrosis of the liver; 1 from abscess of the frontal lobe of the brain with a foreign body; 1 from a focal glomerular nephritis, acute myocarditis and terminal pneumonia; another from focal glomerular nephritis, lobar pneumonia, myocardial degeneration, and toxic and fatty infiltration of the liver.

Comment

The aim in severe burns is to protect the burned area against infection, to prevent loss of fluids and absorption of toxins, and to avert loss of function and production of deformity. Treatment must be instituted promptly and burns given the same priority demanded by any serious emergency.

Many investigators stress the treatment of the general condition, which is important, but it is imperative to remember that the local condition is the primary aggravating factor. It has been found that duration of illness and mortality in burn cases are considerably reduced when treatment is under unified control.

There are many important advantages to the open method of treatment used successfully in this series: greater ease of dressing than in some methods; no anesthetic necessary for dressings; debridement facilitated; constant wound evaluation, so that grafting can be done at the optimum time; active and passive motion can be started early, and drainage is promoted.

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Multiple Smallpox Vaccinations in the Treatment of Recurrent Herpes Simplex

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On the basis of the study here reported, the authors conclude that multiple smallpox vaccinations are of value in the management of patients with recurrent herpes simplex. Of 68 cases reviewed, 52 patients (76.5 per cent) definitely had no subsequent attacks during a lengthy follow-up period; 7 patients were probably cured, and the recurring lesions in the remaining 9 patients were less severe than those preceding therapy with a longer interval between attacks. The specific mechanism for the benefit noted is not fully understood.

HERPES simplex is a disorder which is characterized by the development of a group or groups of vesicles, on an edematous, erythematous base, with spontaneous healing occurring after a period of approximately 7 to 10 days. The causative agent is a virus which under certain conditions, such as fever, exposure to sunlight and hormonal changes, becomes activated. Any area of the body surface may be involved, although the face, oral mucosa and genitals are the sites of predilection. Symptoms are generally burning and heat. In those cases where there is involvement of the oral mucosa, pain and burning may be severe enough to produce considerable distress.

Although in certain instances the single attack of herpes simplex may be responsible for the patient's seeking medical care, it is generally only in those cases where the individual has experienced repeated attacks that the physician is called on to practice his healing arts. More correctly, he is called on to take steps to prevent future outbreaks and the concomitant cosmetic and sensory disturbance.

Gildemeister and Herzberg,[1] in 1925, produced a relative immunity of the rabbit cornea against smallpox vaccine by previously inoculating it with the virus of herpes simplex. On the basis of these observations they raised the question as to the herpes virus being a variant of that of smallpox. Heymann,[2] in 1926, quoted Jenner's observations on the inhibition of the smallpox vaccine pustule in subjects with herpes. Freund,[3] in 1928, described favorable results with the use of cowpox lymph in the treatment of 7 patients with recurrent herpes simplex. Bedson and Bland,[4] in the same year, inoculated guinea

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pigs with the virus of herpes and others with the virus of vaccinia and, after recovery from the primary infection, tested them for immunity against the other. On the basis of their results they concluded that the two viruses were unrelated. Nevertheless, Minami and Ohmichi,[5] in 1930, reported successful results in 10 cases of recurrent herpes treated prophylactically with a single smallpox vaccination. Wise and Sulzberger,[6] in 1934, stated that they had had satisfactory results in a small number of cases of herpes simplex treated by repeated smallpox vaccinations.

Foster and Abshier,[7] in 1937, reported on 35 patients with frequent, regular, recurrent herpes simplex treated by vaccination. This was generally given at two week intervals, with most patients receiving a total of 4 vaccinations. Recurrence following therapy occurred in only 5 patients (14 per cent). They explained their results on the basis of a close relationship between the virus of herpes simplex and that of variola. As a result of cross immunity, they maintained, the smallpox vaccine acted to raise the antibody level to a point which would prevent an invasion of the herpes virus. Ullman,[8] in 1939, described the beneficial effect of a single smallpox vaccination in preventing recurrence in each of 4 cases. Davis,[9] in 1940, reported good results in 14 patients with recurrent herpes simplex treated by multiple vaccinations.

Woodburne,[10] in 1941, described his observations in 22 cases of herpetic stomatitis treated with 2 to 15 vaccinations. In 8 of these there was recurrence, but always slight, and in each instance cure was achieved with 1 to 7 additional vaccinations. Keddie and coworkers,[11] in the same year, reported on their results with the use of a single vaccination given a few days to a few weeks prior to artificial fever therapy. They observed no decrease in the incidence of herpes simplex. In discussing this paper, Schoch[12] maintained that failure in their series was due to the fact that a single vaccination given shortly before the fever did not allow enough time to elapse for immunity to be built up to a sufficient level to offer protection. In his own series of patients who were vaccinated six or seven times there was protection for at least a year in 62 per cent. Kile,[13] in the same discussion, stated that smallpox vaccinations are of no value in the management of recurrent herpes simplex. Seale,[14] however, stated that he had obtained satisfactory results in 80 per cent of his cases treated in this fashion. He further argued that the poor results obtained by Keddie and co-workers was due either to the overwhelming dose of the precipitating factor used in contrast to the milder one generally experienced in clinical practice, or to the short lapse of time between vaccination and fever.

Arnold,[15] in 1944, reported on 14 cases of recurrent herpetic stomatitis more or less successfully treated by intradermal injections of smallpox vaccine. Anderson,[16] in 1945, called attention to the probable etiologic relationship between herpes simplex and erythema multiforme. In his hands, during the preceding 10 years, repeated smallpox vaccinations had been successful in about 80 per cent of the cases of recurrent herpes. He used this same procedure for the preventive therapy of erythema multiforme associated with herpes simplex and also in cases of erythema multiforme in which no such association could be determined. He found this therapy of value in the prevention of recurrence of erythema multiforme, especially that preceded by herpes simplex. Pepys,[17] in 1946, described 2 cases of recurrent herpes simplex, one with attacks every two months over a 45 year period and the other with attacks every two to three months over 20 years; after 3 vaccinations, given at intervals of four weeks, there were no further outbreaks.

During the past seven years we have been treating all cases of recurrent herpes simplex with smallpox vaccinations. In view of the excellent results obtained in a large series of patients we are presenting this report to call general attention to this simple and generally adequate method of managing an otherwise difficult condition.

Case Report

A total of 68 patients were treated. The material used was regular smallpox vaccine,

SMALLPOX VACCINATIONS IN TREATMENT OF HERPES SIMPLEX*

AGE	SEX	LOCATION OF LESIONS	DURATION OF DISEASE BEFORE THERAPY (months)	NUMBER OF ATTACKS BEFORE THERAPY	FREQUENCY OF ATTACKS (weeks)	NUMBER OF VACCINATIONS	RECURRENCE AFTER VACCINATIONS (months)	FOLLOW-UP AFTER THERAPY (months)
30	M	Thumb	23	9	10	8	0	72
19	M	Mouth	12	6	8	4	0	60
36	F	Chin	7	2	14	2	3	—
13	M	Cheek and mouth	16	2	32	4	0	60
17	M	Lip	8	2	16	4	0	60
15	F	Chin	7	3	9	3	0	48
40	M	Lips	6	4	6	2	0	48
20	F	Mouth	8	3	10	3	0	48
2	M	Axilla	3	2	6	2	0	48
38	M	Cheek	12	3	16	2	18	—
21	M	Penis	13	5	11	5	0	48
22	F	Lip	8	5	6	3	13	48
22	F	Lips	7	3	9	3	0	48
30	F	Chin	9	4	9	3	0	48
24	F	Chin	6	2	12	3	0	48
24	F	Lip	13	5	11	4	0	48
38	M	Penis	14	6	9	3	6	—
29	F	Thigh	5	3	6	3	0	48
48	M	Forehead	8	3	10	3	0	48
20	F	Lips	11	5	8	3	0	36
35	F	Cheeks	24	6	16	5	0	36
20	F	Lip	7	2	14	2	0	36
16	M	Lip	9	5	7	4	0	36
24	F	Cheeks	13	5	11	4	0	36
7	F	Nasolabial fold	6	2	12	2	0	36
19	F	Hip	7	3	9	2	0	36
20	F	Lip and nose	12	4	12	2	0	36
7	F	Buttocks	9	4	9	4	6	—
20	M	Penis	8	3	10	5	0	24
24	M	Penis	6	2	12	2	0	24
2	M	Groin	7	2	14	2	0	24
27	F	Nasolabial fold	5	2	10	2	0	24
35	M	Penis	8	3	10	3	0	24
31	M	Generalized	4	2	8	4	0	24

*All patients are white.

administered by the multiple puncture technic, the deltoid region being the site of inoculation. Vaccinations were given every two weeks, except in those instances where a primary, nonimmune reaction was elicited. When this occurred the second vaccination was not given until the initial reaction had subsided. As indicated in the table, the number of vaccinations given varied from 2 to 8, most patients receiving 2 or 3.

All the patients were white, with about an equal distribution between the sexes. The youngest was 2 and the oldest 65 years of age, most of the cases being in the third and fourth decades of life. In 20 patients the lesions occurred on the face, in 15 on the genitalia, in 11 on the lips, in 5 on the neck, in 4 within the mouth, in 3 on the thigh, and in single cases the lesions were on the leg, buttocks, axilla, cheek and mouth, thumb, hip, groin, lip and nose, lip and mouth, and in one case they were generalized. The duration of disease prior to therapy varied from one month to 20 years, with most of the patients having had recurrent attacks for 5 to 10 months before the institution of our treatment. The number of attacks prior to therapy varied from 2 to approximately 50, 33 having had 2, 16 having had 3, 7 with a history of 4, 6 with 5 attacks, 1 with 9, 1 with 16, and 1 with

SMALLPOX VACCINATIONS IN TREATMENT OF HERPES SIMPLEX*

AGE	SEX	LOCATION OF LESIONS	DURATION OF DISEASE BEFORE THERAPY *(months)*	NUMBER OF ATTACKS BEFORE THERAPY	FREQUENCY OF ATTACKS *(weeks)*	NUMBER OF VACCINATIONS	RECURRENCE AFTER VACCINATIONS *(months)*	FOLLOW-UP AFTER THERAPY *(months)*
37	F	Chin	7	2	14	3	0	24
30	F	Nasolabial fold	6	2	12	2	0	24
4	F	Neck	3	2	6	2	0	24
17	M	Chin	8	3	10	4	0	24
20	F	Cheek	6	2	12	2	0	12
21	M	Penis	8	3	10	4	0	12
16	M	Penis	13	4	13	3	11	12
36	M	Penis	6	2	12	2	0	12
21	M	Penis	9	4	9	5	0	12
21	F	Vulva	4	2	8	3	0	12
21	M	Lip	6	3	8	4	0	12
3	F	Lip	6	2	12	2	0	12
27	F	Thigh	2	2	4	4	0	12
36	M	Penis	2	3	3	5	0	12
25	M	Neck	1	2	2	2	0	12
37	M	Penis	5	2	10	3	0	12
46	F	Vulva	7	2	14	3	0	12
17	F	Chin	2	2	4	3	0	12
39	F	Lips	4	2	8	2	0	12
65	M	Neck	5	2	10	2	0	12
5	M	Forehead	3	2	6	2	0	12
60	F	Face	6	2	12	2	0	12
59	F	Neck	10	4	10	4	0	12
23	M	Cheek	1	2	2	2	0	12
23	F	Thigh	4	2	8	2	0	12
24	M	Cheek	11	2	22	3	0	12
30	M	Penis	6	2	12	3	0	12
19	F	Nose	10	3	13	5	8	12
22	F	Mouth	4	3	5	2	0	12
29	F	Leg	7	2	14	4	0	12
23	M	Penis	6	2	12	4	0	12
23	M	Neck	8	3	10	4	0	12
36	F	Lip and mouth	240	50	3	3	3	6
19	M	Mouth	12	16	2	6	3	6

*All patients were white.

about 50. The frequency of attacks prior to therapy ranged from every 2 to every 32 weeks, 41 patients having had their attacks at two to three month intervals.

Of the 68 patients in our series, recurrence following the course of treatment occurred in only 9. In each case where recurrence took place, the lesions following therapy were less severe and the interval between attacks prolonged. Of these 9 failures, 5 failed to return for further treatment. The remaining 4 received an additional 2 to 3 vaccinations and in 3 cases no subsequent attacks occurred; the fourth has had only one mild attack since the additional vaccinations.

Two patients have been followed for six months, 28 for one year, 10 for two years, 8 for three years, 12 for four years, 3 for five years and 1 for six years. All, with 7 exceptions, were seen in person to obtain confirmation of the fact that they had not had a recurrence. The 7 others were reached by telephone at which time they stated that they had not had subsequent attacks. However, some doubt may be cast since they refused to come in personally to discuss this.

Discussion

Different explanations have been offered for the good results obtained with smallpox

vaccinations in the prevention of recurrent herpes simplex. Ullman[8] speculated as to whether it might be due to "suggestion." Blank and Brody[18] have stated that in some cases herpes simplex is the result of a psychiatric disorder. The favorable response of some patients to nonspecific measures they attribute to the fact that "suggestive" therapy was used by the physician. However, Sulzberger and Baer[19] pointed out that they had never seen a patient with recurring herpes simplex proved to be definitely cured by psychiatric measures. It would further appear most unlikely that the high percentage of cures we obtained could be due to suggestion.

Gildemeister and Herzberg[1] demonstrated what they believed was cross immunity between the virus of vaccinia and the virus of herpes and on this basis concluded that the two were closely related. According to Foster and Abshier,[7] as a result of this cross immunity, the action of smallpox vaccine is to raise the antibody count above that which allows invasion of the herpes simplex virus.

Other investigators, however, have cited the work of Bedson and Bland[4] which indicated that the two viruses were unrelated. Brain[20] maintained that the improvement observed in those cases treated with vaccination was due to a nonspecific effect.

Various workers[20-23] have attempted a more direct approach to the problem by using the virus of herpes simplex itself. In all cases the virus was transmitted to animals and then killed with formalin, phenol or heat. In general this form of therapy produced improvement. However, the results have not been as good as those obtained with smallpox vaccine. Sulzberger[24] stated that in using smallpox vaccine one was employing the living variola virus from the standpoint of a nonspecific effect of one living virus on infection with the other. This method, he further stated, had the disadvantage of being nonspecific, but the advantage of using a living virus. In the other method, however, one was employing the specific virus, but it was dead.

One other observation by Wise and Sulzberger[25] bears noting. They stated that successful vaccination might act not only by increasing circulating immune bodies but also by changing tissue responses in some unknown way. This would be analagous to what is presumed to occur, for example, in cases of ragweed oil dermatitis treated by the usual immunologic procedure.

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Local Hydrocortisone Acetate for Radiation Proctitis

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In this article is described a means of controlling the disabling symptoms of a common complication seen in radium treatment of carcinoma of the cervix uteri. Four cases treated thus are presented; results were uniformly good.

A. HURTIG

COMPLICATIONS of radium treatment for carcinoma of the cervix uteri are reported by most clinics to occur in between 10 and 20 per cent of patients. The clinics reporting the highest rate of five year cures also, as a rule, report higher percentages of radiation injury. The most common complication reported is radiation proctitis and/or sigmoiditis. The symptoms vary from a transient early diarrhea, which is not important as it may disappear soon with or without treatment, to a more severe, later type of mucous, bloody diarrhea accompanied by severe pain and rectal spasm for which there is no satisfactory treatment except narcotics. The severe types are as destructive and as painful as the malignant process itself. End results of severe injury are various degrees of rectal or sigmoid stenosis, fistula formation, peritonitis and drug addiction.

The best treatment, of course, is prevention. Patients seem to vary in their inflammatory response to radiation. Palliative treatment to date includes enemas of various types, antidiarrhea drugs and opiates, none of which are satisfactory.

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Presented here are the histories of 4 cases of severe radiation proctitis treated at the Ottawa General Hospital since April 1952. The treatment is purely empiric and symptomatic. All diagnoses were confirmed by proctoscopic or sigmoidoscopic examination. Rectal spasm and tenderness are often severe and proctoscopic examination often must be preceded by local cocaine anesthesia. Sigmoidoscopic examination is often difficult and dangerous owing to increased friability of the bowel wall. Only cases showing the accepted gross picture of radiation injury are included in this report.

The medication was instilled through a rubber urethral catheter with the patient in the knee-chest position in her own bed. It was then flushed in with normal saline solution to disperse the drug and force it higher up the sigmoid. The patient lay on her abdomen for one hour and then was encouraged to stand or sit up. In this way we felt that whatever drug remained would gravitate back to the rectal ampulla which is usually the site of the most intense reaction. All these patients were having frequent bowel movements, but all managed to retain the solution for at least two to three hours.

The relief of symptoms was uniformly immediate and gratifying. Follow-up procto-

scopic findings showed very little change, even in asymptomatic patients, except that bleeding, mucus and fragility seemed decreased. Ulceration, when present, persisted but looked much cleaner. AUREOMYCIN®, 250 mg. every 6 hours by mouth, was started 48 hours before treatment and continued for one week, as a wide spectrum antibiotic. This we felt was necessary to offset the increased local tissue permeability to the bacterial invasion induced by local introduction of hydrocortisone. Otherwise the combination of ulcerated or anoxic mucous membrane and bacteria and hydrocortisone theoretically might expose the patient to danger of spontaneous bowel perforation. Simultaneous eosinophil counts did not indicate any systemic effect of cortisone acetate or hydrocortisone acetate when instilled in these amounts in the rectum.

Case Reports

Case 1—Mrs. R. R. was admitted to the hospital March 31, 1952, with a diagnosis of epidermoid carcinoma of the cervix, undifferentiated type, grade 2, stage 2. She received total radium of 7800 mg. hours and deep x-ray therapy, 10,200 r. The last radium was removed May 7, 1952. On May 12 there appeared painful diarrhea, mucus and bleeding. BANTHINE®, codeine, tincture of camphor, potassium permanganate rectal instillation, barbiturates, etc., gave no relief and the patient became anemic, lost weight and required frequent injections of DEMEROL® for the first time since admission. On May 16, 17 and 18, 100 mg. of cortisone acetate, suspended in 3 oz. of water, were given once daily as retention enemas. Relief was partial in 48 hours and complete in 96 hours from the start of this treatment and there was no return of symptoms. In October 1953, the patient was still alive, well and asymptomatic.

Case 2—Mrs. H. M., age 52, had had a subtotal hysterectomy elsewhere in 1950. In April 1953 she was found to have squamous cell carcinoma, stage 2, of the stump of the cervix. On April 7, 1953, she received 4380 mg. hours of radium therapy and on April 18 she was given the same dose. Deep x-ray therapy, 11,000 r., was given from April 13 to April 30. From April 18 to April 25 she suffered from liquid diarrhea, pain, mucous discharge and bright bleeding. On April 25, 125 mg. of hydrocortisone acetate were instilled into the rectum and flushed in with 50 cc. of normal saline solution. On April 26, there was no diarrhea for the first time in eight days; there was no pain, only slight mucous discharge and no narcotics were requested. On April 27 the patient had three formed stools for the first time in eight days. By April 30 there were no complaints and she was having four to five formed bowel movements per day. Up to October 1953 there had been no recurrence and the patient was well.

Case 3—Mrs. H. H., 54 years old, was diagnosed in June 1951 as having squamous cell carcinoma of the cervix, stage 2. From July to September 1951 she received 12,000 mg. hours of radium and 11,400 r. of deep x-ray therapy. She was admitted to the hospital June 3, 1953, with a history of intermittent diarrhea for the previous 16 months, mucous discharge, bleeding, feeling of urgency and partial incontinence. She was having 9 to 20 bowel movements per day. Examination showed no extension of the disease. While in the hospital the patient required frequent injections of Demerol. On June 9 she received 125 mg. of hydrocortisone acetate instilled into the rectum and flushed in with 20 cc. normal saline solution. On June 10 she had no bowel movements, bleeding or mucus for the first time in 16 months. On June 12 she had one solid, formed bowel movement and was comfortable. No narcotics have been requested since the last treatment. When seen on September 30, 1953, there was no bleeding, but slight mucus, and four stools per day, with diarrhea only once or twice per week.

Case 4—Mrs. J. B., 64 years old, was diagnosed in August 1953 as having squamous cell carcinoma of the cervix, grade 1, stage 3. She received 5,280 mg. hours of radium therapy on August 18 and was given 10,500 r. of deep x-ray therapy from August 13 to September 16. She had profuse, liquid diarrhea on August 30. On September 7 she was still having diarrhea and also mucus and bleeding, accompanied by pain. In the morning of Sep-

tember 9 she had five fluid, bloody bowel movements. In the afternoon of that day she received 125 mg. of hydrocortisone acetate instilled into the rectum and flushed in with 50 cc. of normal saline solution. On September 10 there was no diarrhea but she complained of a new, severe, burning sensation in her abdomen. By the next day the burning sensation was decreasing and there were no bowel movements. On September 12 she had two formed stools, no mucus and no bleeding. On September 15, she had diarrhea for 24 hours but it cleared spontaneously. By October 1 she had no complaints.

Attempts were made to use a 1 per cent ointment of hydrocortisone acetate in a similar manner but we found it difficult to measure accurately and to place the ointment high enough without wasting too much of this expensive drug and without damage to the friable bowel. Our impression was that the results were quite comparable.

These patients have not been followed long enough nor is the series large enough to estimate the effect of such treatment on the incidence of long range complications such as obstruction and fistula.

Summary and Conclusions

1. Radiation proctitis and sigmoiditis are common complications of radiation therapy for carcinoma of cervix.

2. Accepted forms of treatment seem to give very little relief.

3. Instillation of hydrocortisone acetate suspension into the rectum and sigmoid, in the manner outlined, gives immediate symptomatic relief which lasts for surprisingly long intervals.

4. These are the first reports of this type of treatment and the method deserves similar trial elsewhere.

5. No attempt has been made to rationalize the mechanism of physiologic response. How it might affect the actual radiation injury itself cannot be estimated.

6. Radiation cystitis might be treated in a similar manner.

This work was supervised by Dr. A. L. Richard, Professor of Obstetrics and Gynecology and Dean of the Faculty of Medicine, University of Ottawa. Aureomycin was supplied by Lederle Laboratories; cortisone acetate and hydrocortisone acetate were supplied by Merck & Co., Inc.

Postgraduate Clinical NOTES

15. HORMONE THERAPY AT THE MENOPAUSE

If a medical student in this school were asked to enumerate the causes of bleeding after the menopause or the causes of irregular bleeding just before the menopause, he would base his answer on his outpatient experience and teaching and place estrogens administered in general practice high among the causes. Estrogen-induced bleeding is, in fact, a new disease in gynecology and many patients have to be admitted for curettage to exclude cancer, for the simple reason that the responsibility for exclusion of cancer as the cause of bleeding at the climacteric requires nothing less.

Hugh C. McLaren, *The Practitioner*, November 1953, p. 500

Some Neurologic Causes for Difficulty in Walking

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Gait disturbances may result from disorder of muscles, of peripheral nerves, or from lesions at various levels of the central nervous system. Symptoms and signs suggesting the localization of such lesions are discussed in this article.

ALEXANDER T. ROSS

ONE of the requirements and pleasures of living is the ability to change the relationship of the body to its environment. For most of us this is done by bipedal locomotion—walking. When this ability is interfered with our activities are restricted; this causes concern. Obviously there are many conditions to be considered when a patient complains of difficulty in walking, but I shall call attention only to some of the most common and important neurologic conditions causing this symptom.

Walking not only requires supporting skeletal structures, mobile joints and well-nourished musculature but also depends on the integration of many types of reflexes. Among these are the simple reflexes at the spinal cord level, the righting and labyrinthine reflexes to maintain the proper relationship of the head, trunk and limbs to one another, and the postural reflexes to maintain extensor tone. Thus, difficulty in walking may result from disorders of muscles themselves, of peripheral innervation, of spinal cord disease, of lesions in the brain stem and cerebellum, of affections of the basal ganglia, and of disturbances of cerebral function.

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Muscle Disorders

The most important muscle disorders are the dystrophies. Parents usually bring a child, most often a boy, to the physician because the youngster is awkward, waddles, falls easily and is weak. Such weakness is mainly in the trunk and girdles where frequently the muscle groups are wasted. The muscles of the calves stand out in contrast because of pseudohypertrophy. The child has a characteristic waddling, lordotic gait as well as the pathognomonic method of arising from recumbency by "climbing up the legs." In this disease of the muscles there are no sensory defects.

The dystrophies differ from the muscular atrophies by occurring in childhood, by affect-

ing proximal muscles predominantly, by the absence of fasciculations, and by having a familial tendency.

A form of muscular atrophy that occurs in childhood is the neural type of Charcot-Marie-Tooth. This too has a familial tendency and is characterized by slowly progressive weakness, clumsiness and atrophy of the muscles below the lower third of the thighs. This gives the child the typical stork-leg appearance. The patellar and Achilles reflexes are absent, and there is usually mild reduction in sensory perception. Often there are associated weakness and atrophy of the hand muscles. The disease progresses slowly to severe disability.

Among the myopathies are two characterized by delayed relaxation of contracted muscles: myotonia congenita and myotonia atrophica. The former has a strong familial occurrence. Walking is affected—sluggishness and tightness are noticeable in beginning the movements but soon subside. In the latter there is atrophy of the facial muscles resulting in the typical "hatchet face" as well as atrophy of the sternomastoid, forearm and hand and leg muscles, accounting for a steppage gait. Other features of myotonia atrophica are cataracts, testicular atrophy and frontal baldness. In addition myotonia is noted particularly by the delay in relaxing the hand grasp. In both diseases relief of symptoms is obtained by the use of quinine.

Another common disorder of muscles which is receiving more attention is myasthenia gravis. The pathophysiology of this disease is still controversial, but evidence points to a disturbance in the utilization of acetylcholine at the myoneural junction. Although the main symptoms of myasthenia gravis are referable to the ocular and bulbar musculature, it is not unusual for them to pertain to walking and, especially, to climbing stairs. Patients tire rapidly and must rest several minutes before proceeding. Often there is aching in the back and legs leading to the suspicion of some orthopedic condition. A helpful and sometimes dramatic therapeutic test is the ingestion of PROSTIGMIN® bromide, 15 mg., several times a day, producing marked improvement in strength and stamina.

Peripheral Nerves

Involvement of individual nerves, plexus lesions, or implication of multiple nerves or their roots may interfere with walking.

For example, the sciatic nerve may be injured or inflamed resulting in the inability to flex or extend the foot and to flex the leg. The patient walks with his leg extended. This condition is accompanied by atrophy of the affected muscles, sensory loss below the knee except on the inner aspect of the leg and loss of the Achilles reflex. An incomplete lesion is often aggravated by causalgia, making locomotion extremely painful.

Peroneal palsy is frequently due to pressure or to stretching of the nerve by prolonged squatting or kneeling. This condition was seen frequently in bombardiers or ball turret gunners aboard certain types of aircraft. Thin persons, particularly convalescents, with the habit of crossing their legs while reading are prone to develop drop foot.

The femoral nerve may be injured by wounds, stretching or intrapelvic pressure. The patient is unable to extend his knee or to fix it as a result of quadriceps weakness. This is especially evident in going up or down stairs. When standing his leg frequently buckles. The muscle atrophies, the patellar reflex is lost, and reduction in sensation is outlined on the anteromedian aspect of the thigh and leg.

Lesions within the pelvis, particularly carcinoma, frequently implicate the lumbosacral plexus, giving rise to severe pain in the thigh and leg, extensive muscle weakness and atrophy, sensory impairment and reduction of tendon reflexes. Often the bladder is affected. The distribution of involvement is more widespread than in the affection of single nerves.

Cataloging the number of agents—allergic, chemical, infectious, metabolic, toxic—that can be associated with lesions of multiple nerves or roots is an exercise of imagination. Among the most frequent are alcohol with avitaminosis, arsenic, lead, diabetes, porphyria, diphtheria (either faucial or cutaneous), prolonged gastrointestinal disorders and virus infections. The symptomatology in practically all of them, however, is similar but not necessarily identical. The picture is usually one of

symmetric weakness, atrophies, pains, paresthesias, tenderness, sensory deficits and reduction in tendon reflexes in the upper and lower extremities. Sometimes the cerebrospinal fluid exhibits the Guillain-Barré dissociation; that is, an elevated protein content with a disproportionate paucity of cells. Incidentally, this dissociation may not manifest itself until two or three weeks after a clinical diagnosis of polyradiculitis is established.

Spinal Cord

Perhaps the most frequent neurologic cause for difficulty in walking is an affection of the spinal cord. This structure contains not only multifarious intersegmental reflex mechanisms, but it also carries the long ascending sensory and descending motor tracts through which various levels of the neuraxis are functionally integrated. Involvement of these finely adjusted mechanisms, therefore, will be manifested by disorders in motion, power, tone, coordination, sensation and reflexes. There are many conditions which implicate this peculiarly vulnerable structure.

Congenital malformations, such as meningomyelocele, dysraphia, and diastematomyelia, will, of course, prevent or retard walking. Dermoid cysts or lipomas associated with spina bifida and other developmental disturbances of mesodermal structures may produce symptoms early or late in life. The same may be said of the Arnold-Chiari malformation in which the cerebellar tonsils and medulla are displaced through the foramen magnum. The result is compression of the pyramidal and cerebellar tracts, implication of the lower cranial nerves and increased intracranial pressure. Roentgenograms frequently reveal an associated deformity of the foramen magnum and upper cervical vertebrae as well as sacral spina bifida. Surgical decompression of the involved structure is usually beneficial.

One need not elaborate on anterior poliomyelitis and its familiar residua which may be mild or so extensive as to be totally incapacitating. However, it is necessary to caution that if there are sensory deficits or signs of pyramidal tract damage, the condition is not anterior poliomyelitis.

Multiple sclerosis can be one of the easiest or one of the most difficult diagnoses to establish. It occurs most often in persons between 20 and 40 years of age. It is characterized by its involvement of dissociated nervous structures such as the optic nerves, the cerebrum, the cerebellum, the pons and the spinal cord. A composite history includes clumsiness in walking, numbness of one leg and then the other, urinary urgency, transient diplopia, episodes of blurred vision, thickness of speech and awkwardness of the hands. These symptoms may fluctuate in intensity. One usually finds ataxia of the hands and feet, nystagmus, slurred speech, hyperactive tendon reflexes in the legs, Babinski's sign, impairment of proprioception, a spastic-ataxic gait and absent superficial abdominal reflexes. Sometimes the onset is apoplectiform and the course devastating. On the other hand the symptomatology may confine itself to the spinal cord and simulate tumor. However, there is no block on the Queckenstedt test, and the protein content of the cerebrospinal fluid is not elevated to the degree it usually is in tumor.

Tabes dorsalis is primarily a sensory system disease. There are lightning pains, uncertainty in placing the feet, especially in the dark or on uneven ground, impaired position and vibration sensibility in the feet, delayed pain perception, a positive Romberg sign and absence of the patellar and Achilles reflexes. One may assume that if knee and ankle jerks are present the patient does not have tabes dorsalis. Correlative findings are Argyll Robertson pupils, primary optic atrophy and Charcot joints. The Wassermann reaction in the cerebrospinal fluid is positive in about 75 per cent of the cases.

For practical purposes posterolateral sclerosis is considered a part of pernicious anemia. There are usually paresthesias in the feet and hands, clumsiness and weakness in walking and urinary dysfunction. The gait is ataxic, position sensibility in the feet is impaired, vibration sensation in the legs is almost invariably lost and Babinski's sign is ordinarily present. The patellar and Achilles reflexes are usually absent, but they may be overactive. Gastric achlorhydria is present.

It is of utmost importance to realize that involvement of the nervous system may precede the manifestations in the blood, but detection and early treatment will in most instances forestall progression of neural embarrassment. A tragic example is that of a man whose weakness and difficulty in walking was considered psychogenic. He received vigorous insulin and electroshock therapy, but his trouble progressed to the point of paraplegia, incontinence, gross sensory loss and decubiti. After months of specific and adjunctive therapy he became able to take a few steps with support and have partial bladder control.

Another combined system disease manifesting itself early and having a strong familial tendency, is Friedreich's ataxia, the outstanding features of which are progressive disability in walking reaching the point of total incapacity, a typical foot deformity characterized by a high arch, dorsiflexion at the metatarsophalangeal joints and flexion at the interphalangeal joints, absent patellar and Achilles reflexes, impairment of position and vibration sensibility in the feet, Babinski's sign, nystagmus and slurred speech.

Amyotrophic lateral sclerosis and progressive spinal muscular atrophy denote degeneration of the anterior horn cells and pyramidal tracts. There is atrophy and weakness of the musculature with, in the former, spasticity of the legs. Fasciculations are prominent. Since both are motor system diseases there are no sensory changes, a point of differentiation from syringomyelia and intramedullary tumor.

Myelitis or myelopathy may complicate any infectious disease, occur with blood dyscrasias, or be the result of occlusion of spinal vessels or of severing wounds. The onset is usually abrupt and manifests itself as a flaccid paraplegia with sensory deficits and incontinence. Spasticity generally supervenes later.

The subject of compression of the spinal cord in itself is large, and only the most salient aspects can be discussed. The main symptoms depend on the rapidity of compression. Acute lesions cause flaccid paralysis, sensory loss and absence of tendon and superficial reflexes below the level of the lesion together with an atonic bladder and rectum. This is seen in fracture-dislocations due to trauma, pathologic fractures secondary to malignant metastases to the spine, and in acute epidural abscess.

In chronic compression there are progressive weakness, spasticity, overactive reflexes, Babinski's sign, sensory impairment, and perhaps root pain at the level of the lesion. Among the causes for this are intramedullary and extramedullary tumors of the spinal cord, epidural granuloma or tumor, syringomyelia, extruded cervical intervertebral disk, postmeningitic arachnoiditis and postspinal anesthesia adhesive arachnoiditis. Examination of the cerebrospinal fluid usually discloses indications of a partial or complete block on jugular compression and an elevation in protein content. The level of the lesion can usually be ascertained accurately by careful clinical examination. However, PANTOPAQUE® myelography affords visual substantiation of the site of the obstruction and is usually undertaken prior to surgical intervention. Roentgenograms may or may not reveal bony lesions.

Those compressive lesions which are susceptible to surgical attack should be treated as absolute emergencies, for irreparable damage to the spinal cord can occur in a matter of hours.

Tumors of the spinal cord do occur in children and suspicion of them should be entertained when signs of progressive neural dysfunction occur in patients considered to have residua of poliomyelitis. Postpoliomyelitic paralysis does not progress. An example is a 5 year old boy, who, despite the absence of a history of acute poliomyelitis, received intensive physical therapy for weakness and clumsiness of the legs presumed to be the result of this disease. He developed urinary retention and was admitted to the hospital. He was found to have spastic paraparesis, perianal analgesia, extensive sensory impairment and bilateral Babinski sign. The cerebrospinal fluid dynamics showed a block on jugular compression and the protein content was 4500 mg. per cent. He had an extensive astrocytoma in the sacral portion of the spinal cord.

The cauda equina and conus medullaris

can be implicated by tumor, trauma or adhesions. There are pain, weakness and atrophy of the legs, absent Achilles reflex, segmental sensory impairment and incontinence of bowel and bladder. The saddle area must always be tested for sensory deficit and roentgenograms must be taken of any patient complaining of backache, urinary difficulty and gait disturbances.

A rather common cause for difficulty in walking is herniation of an intervertebral disk These usually occur in the lower lumbar region and produce sharp radicular pain in the distribution of the fifth lumbar or first sacral dermatome. The patient walks with a list and a limp; he sits on the unaffected buttock and rises by pushing with his hands and uninvolved leg. His ankle reflex is usually diminished on the affected side.

Cerebellum

Although developmental, degenerative and vascular lesions affect the cerebellum and produce ataxic gait, the most important causes are tumors. They occur principally in children and produce staggering, headaches, vomiting and choked disks. The two main types are: (1) medulloblastoma which favors the vermis, produces truncal ataxia, seeds throughout the subarachnoid system and is invariably fatal and (2) astrocytoma which has a greater tendency to occur in a hemisphere, thus giving predominantly homolateral cerebellar dyssynergia, and which, if accessible and completely removed, carries an excellent prognosis. It is impossible to make a positive preoperative diagnosis of the type of tumor; therefore, because the prognosis is so different in the two, it is important that exploration and biopsy be done.

Brain Stem

The brain stem can be the site of inflammatory, degenerative, neoplastic or vascular lesions, and the differential diagnosis can be very difficult. The characteristic features of lesions in this location are implication of various cranial nerves, cerebellar disturbances, and the presence of alternating hemiplagia or hemianesthesias; i.e., the head on the side of the lesion and the body on the contralateral side.

The commonest occurrence is thrombosis of a posterior inferior cerebellar artery. On the side of the lesion, it produces diminution of facial sensation, weakness of the palate and larynx, Horner's syndrome and ataxia of the arm and leg, and on the opposite side, impairment of pain and temperature sensibility. These symptoms are accompanied by vertigo and staggering.

A second important lesion in this area is acoustic neurinoma. The usual chronology consists of unilateral tinnitus followed by progressive deafness, paresthesias in the face, headache and staggering. One finds ipsilateral absence of cochlear and labyrinthine function, diminution of corneal sensation, facial weakness and cerebellar dyssynergia, as well as bilateral choked disk. The corneal reflex should always be tested when patients have auditory or vestibular complaints.

Basal Ganglia

Paralysis agitans is characterized by rigidity, tremor, masked facies, a flexion posture and a shuffling, short-stepped gait.

Wilson's hepatolenticular degeneration usually has a familial tendency, occurs in young people and is marked by tremor, rigidity, dysarthria, dysphagia and emotional lability. The presence of a golden-green pericorneal ring practically clinches the diagnosis.

Both Sydenham's and Huntington's chorea are marked by irregular flinging, jerky, involuntary movements that greatly interfere with walking. The former is part of the rheumatic syndrome; the latter occurs in families and is accompanied by intellectual deterioration. Athetosis and dystonia affect locomotion by writhing, twisting movements.

Cerebrum

In childhood malformations, injuries, inflammatory, vascular or degenerative disorders may produce monoplegia, hemiplegia or paraplegia and are included among the so-called cerebral palsies.

In adults the commonest form of walking disability due to brain lesions is hemiplegia.

It is usually the result of a vascular accident such as thrombosis, hemorrhage or embolism. However, the same symptom can occur from primary or metastatic brain tumor, abscess, subdural hematoma, blood dyscrasias, inflammatory and degenerative diseases. These conditions can impair walking in ways other than by causing hemiplegia. They can do so by producing apraxia of the legs so that the patient is unable to execute the proper sequence of movements, or by producing sensory or visual disturbances or disorders in the spatial orientation.

The short shuffling steps of the aged denote multiple little areas of softening; the reeling gait of the punch-drunk fighter results from disseminated small hemorrhages.

Thus, we see that difficulty in walking is a symptom common to a great many of the conditions that affect the nervous system from brain to muscle. By a consideration of correlative symptoms and signs the physician can, in most instances, reach some conclusion as to the site and type of pathology causing this complaint. The type of treatment elected depends on these conclusions. This review, obviously incomplete and telegraphic, alludes to some of the conditions which warrant consideration when a patient says "Doctor, I don't walk right."

Information for AUTHORS

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CASE REPORT

Purpura as a Result of Insect Allergy: Treatment with Cortisone

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A case of severe anaphylactoid purpura of the nonthrombopenic Schoenlein-Henoch type in a child 3 years of age was apparently produced as a result of repeated mosquito bites. Because of the probable allergic mechanism, cortisone and antihistaminics brought about a rapid cure.

ANAPHYLACTOID purpura, or nonthrombopenic Schoenlein-Henoch purpura, occurs chiefly in children and young adults. It is believed to be caused by a sensitization to a specific protein or to a certain food. Histologically, it is characterized by a severe generalized vasculitis, the classic lesion being represented by active inflammatory changes about the smallest vessels with infiltration of inflammatory cells. With destruction and dilatation of the capillaries, there is increased permeability of the capillary endothelium permitting passage of varying proportions of plasma and formed elements of blood. Edema of the epidermis and corium occurs in the affected areas. Clinically, petechiae, ecchymoses, purpuric macules, erythema multiforme-like lesions, erythema nodosa, wheals, hemorrhagic bullae and angioneurotic edema-like lesions appear. The dependent portions of the body, especially the extremities, receive the brunt of the exanthem.

When the submucous tissues of the gastrointestinal system are sufficiently involved, intestinal crises in the form of severe hematemesis, melena, diarrhea, vomiting and colicky pains occur. This form of the disease is known as Henoch's purpura and may simulate an acute abdominal emergency. Schoenlein's purpura is characterized by acute arthritic symptoms produced by effusions of serum and blood elements into the joint spaces. The affected joints become purpuric, painful, swollen, tender, hot and red.

All the urticarial and purpuric manifestations and visceral symptoms occur without any known abnormality of the hematopoietic system.

In most cases, food and drugs have been the offending agents. Among the foods responsible have been milk, eggs, chocolate, nuts, fish, wheat, potatoes, pork, beans and coffee, and among the drugs belladonna, phenobarbital, quinine, gold, arsenic and menthol (in mentholated cigarettes[1]).

This report is concerned with a hitherto unreported cause for this dramatic and sometimes alarming type of mucosal, skin and visceral hemorrhage. It has been well established that bites of insects, such as chiggers, fleas, bedbugs, lice and mosquitoes, are capable of producing specific allergic reactions, and it has been shown that the protein of the salivary secretion of insects can become as specific an allergen as ragweed pollen.

Recent reports by Rockwell[2] and by Heile-

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sen[3] have emphasized especially the specific sensitization reactions, immediate and delayed, which occur following mosquito bites. The former author has shown further that extracts of various portions of mosquitoes produce similar reactions in sensitive individuals. Three types of allergic reaction—urticarial, tuberculin and eczematous—were observed. Heilesen showed that the time required to establish sensitization to the salivary secretion of mosquitoes is about 10 to 12 days, practically the same as that with other antigens. Repeated reports by Shaffer and co-workers[4] indicate that the chief cause of papular urticaria, a widespread itching disorder of children formerly believed to be a variety of atopic dermatitis, is insect bite allergy.

JOHN M. SIEGEL

HUGH E. BROWN

LUSCIAN W. DI LEO

During the late summer and early fall of 1952, the mosquito problem in the Lehigh Valley in Eastern Pennsylvania was greater than it had been for a number of years. Many children as well as adults were seen by physicians for infected mosquito bites, hives and papular urticaria-like eruptions. The present case history is that of one of the children affected in this epidemic.

Case Report

A 3 year old girl was admitted to the Sacred Heart Hospital on September 24, 1952. There was no history of hay fever, asthma, urticaria or any type of allergic disease in herself or other members of the family. Approximately a year before this admission she had been hospitalized for malnutrition and possible rickets and had been somewhat of a feeding problem since then, although no weight loss had occurred. During the early part of September 1952, the patient had been exposed to repeated mosquito bites while playing in a field near her house; however, there were no ill effects until approximately 2 weeks later, i.e., a week prior to admission to the hospital. At that time, while visiting a rose garden, she was a victim of numerous mosquito bites about the exposed parts of the upper and lower extremities. Later in the day, dark reddish blue areas varying from dime to quarter size and surrounding each mosquito bite were noticed by her parents. In addition there were numerous "black and blue" areas extending upward to involve the lower trunk, both anteriorly and posteriorly. Later that evening the hands and feet became swollen.

The following day, much of the swelling of the hands and feet had subsided but severe nausea and vomiting intervened, lasting almost 2 days. With these gastrointestinal symptoms, fever developed. Numerous hivelike lesions appeared in addition to the purpuric areas, the legs and thighs being chiefly involved. The skin became tender, generally. Bowel movements during the next few days were unusually foul-smelling and the vomited material contained small "pellet-like" masses of blood. There were no gross changes in the color of the urine. Some of the dark red and purplish areas in the popliteal spaces, posterior surfaces of the thighs and on the ankles developed into dark red blisters. The child had become fretful and feverish; she refused to eat, and walking appeared to be painful.

On admission to the hospital, the following observations were recorded: The temperature was 102° F. rectally. Purpuric and hemorrhagic spots and urticarial lesions were present on the thighs, arms and lower trunk. Marked pallor was present. The postpharyngeal wall was injected, and moderate dehydration was evident by furring of the tongue.

FIGURE 1. Purpuric lesions predominantly on lower extremities following mosquito bites.

FIGURE 2. Close-up of posterior aspect of thighs, showing ecchymoses and mosquito bites.

The heart and lungs were normal and the liver and spleen were not palpable.

On the day of admission, laboratory studies revealed the following: Blood examination showed an anemia with hemoglobin of 69 per cent, red blood cells 3,570,000. The leukocyte count was normal, differential 48 per cent polys and 52 per cent lymphocytes. Red blood cells appeared normal. There was a normal platelet count and prothrombin time. Bleeding and clotting times were normal, as was the clot retraction time. Sedimentation rate was normal. The urine contained no red blood cells and the stool examination for occult blood was negative. The blood urea nitrogen and the calcium-phosphorus ratio were both normal. In the tourniquet test, a normal number of petechiae appeared in an area 1 inch in diameter after application of infradiastolic pressure for 10 minutes.

On admission, the following dermatologic picture was present: There was an extensive eruption involving the forearms and the lower half of the body consisting of irregular dark blue and reddish macules, purpuric, ecchymotic and petechial lesions interspersed among large urticarial plaques and papules. Many of the latter lesions were surmounted by hemorrhagic puncta—typical of insect bites. Over the thighs and legs were numerous subcutaneous, tender erythema nodosa-like lesions. A number of hemorrhagic vesicles and bullae were present about the ankles and feet. A diagnosis of anaphylactoid purpura was made from the history and clinical picture.

On the day following admission, cortisone therapy was instituted, 10 mg. every 4 hours. The administration of elixir BENADRYL®, 1 dr. 4 times a day, was begun simultaneously.

Within 24 hours improvement was noted. Subsequently, not only did the old lesions gradually clear but no new purpuric areas appeared. After a week, cortisone was discontinued, at which time the patient was prac-

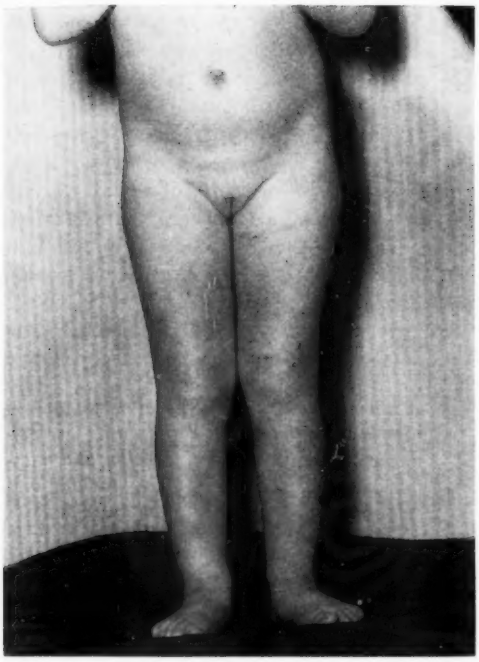

FIGURE 3. Complete clearing of eruption one week following cessation of cortisone therapy.

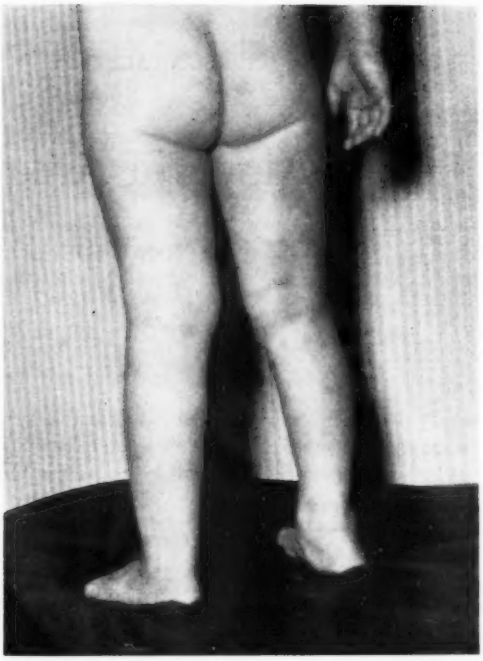

FIGURE 4. Same as Figure 3, posterior view.

tically asymptomatic except for a few fading brownish macules on the thighs and legs. During the following week no treatment was given and no recurrence was noted. The patient was discharged after 2 weeks of hospitalization, perfectly well.

Comment

In the light of our knowledge as to the probable allergic etiology of nonthrombopenic Schoenlein-Henoch type of vascular anaphylactoid purpura, the excellent response to cortisone was understandable. Stefanini[5] and his group were the first to use ACTH in this disease. They obtained an excellent response to the hormone in a white boy aged 3 years with severe vascular anaphylactoid purpura, with associated glomerular involvement. In view of the probable allergic basis and its severe generalized vasculitis, it was felt that this disease was related to the group of diseases which includes disseminated lupus erythematosus, acute glomerulonephritis, polyarteritis nodosa and serum sickness.

It is interesting to note that although a brother and sister were severely bitten by mosquitoes at the same time, the extensive allergic phenomena were restricted to the patient. Since repeated parenteral injections of foreign protein may produce an anaphylactic state, an anaphylactoid reaction appeared following multiple mosquito bites in our sensitized allergic patient.

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CLINICAL STUDY

Alopecia Areata

NORMAN TOBIAS

St. Louis, Missouri

A series of 123 cases of alopecia areata was studied from the standpoints of incidence as to age and sex, location and number of patches, predisposing factors and relapse rate. Therapeutic management is also discussed.

NORMAN TOBIAS

An increasing frequency of alopecia areata has prompted this study in order to ascertain the predisposing factors, the response to therapy and the incidence of recurrences. Clinical studies previously have been made by Brown,[1] Walker and Rothman[2] and Anderson.[3]

The disease is a patchy alopecia of unknown origin which appears suddenly, produces varying degrees of embarrassment and psychic trauma, and follows a capricious course.

In a clinical study of 123 cases, of which 73 were followed, several interesting facts were obtained regarding clinical characteristics, predisposing factors, course and response to treatment. The usual reason the patient consults the physician is fear of total alopecia or embarrassment because of the conspicuousness of the lesion. A frequent query is: "How long will it take for my hair to grow back?"

Incidence, Age and Sex

The incidence of alopecia areata varies from 0.5 to 2 per cent of all dermatologic cases. During epidemics of scalp ringworm, a number of juvenile cases come to the attention of the examiner.

Both sexes are about equally affected, although women are more apt to seek medical attention, even if the lesion is the size of a dime. Men, as a rule, are more worried if the lesions appear on the bearded area. In the present series 56 patients were males and 64 females.

The youngest patient was 3 and the oldest 73 years of age, with the majority less than 40 years old. In 14 cases the patients were under 10, in 18 they were 10 to 20, in 37 they were 20 to 30, in 29 they were 30 to 40, in 18 they were 40 to 50, and in 7 they were over 50.

Premonitory Symptoms

Fifteen patients complained of subjective symptoms before the hair loss appeared. In 5 cases there was a burning sensation; in 2, local tenderness; in 4, pressure headaches; in 2, neuralgic pain, and in 2, itching.

Number and Location of Patches

In 50 cases there was one patch, while in 70 there were multiple patches; these varied from 2 to 10. The site of the scalp involve-

ment according to sex was not charted, but Anderson observed some variation with regard to this factor in the location of the primary patch. He noted that the occipital area was more frequently involved in males and the frontovertical area in females. Because of the sex-linked localization of nuchal neurodermatitis in women, it would appear that the occipital area would be more frequently involved. In our series, 99 cases were limited to the scalp, 9 involved the scalp and bearded area, 4 the bearded area, 5 the scalp, eyebrows and lashes, 2 the forearms and 1 the chest.

Predisposing Factors

While the actual cause of alopecia areata is unknown, various trigger factors appear to have some effect on the neurovascular mechanism of the hair papillae. Thirty-six patients gave a definitive history of specific factors they thought provocative, while Cormia[4] found recent psychic trauma in all cases in his series.

Definite psychosomatic factors were present in 36 per cent of our cases, including business worries, serious injuries or operations in members of the families, pending divorce suits, strain preceding school examinations, etc. In only 3 cases was there a history of acute febrile disorders. In 11 cases there was an association with pregnancy, 5 occurring during the last trimester and 6 during the postpartum period. We have not observed enough cases occurring during pregnancy to be impressed that an endocrine factor is operative.

Familial Incidence

Other members of the family were affected in 19 per cent of Anderson's series, but we obtained a familial history in only 2 cases—1 following the disease in a mother by 2 weeks and the other a sister by 4 weeks. Psychic factors probably are the sole cause of these familial cases and not an infectious basis.

Focal Infection

Only 3 patients had definite focal infections that could possibly have been associated with the disease (chronic tonsillitis, gingivitis and chronic cholecystitis). In Anderson's series 15 per cent had some form of focal infection, but he offered no proof of any direct or indirect effect related to the disorder.

Trauma

Six patients gave a history of some form of trauma antedating the hair loss (injury to the scalp, hair pulled in a fight, water dripping from overhead water pipes, being thrown off a horse). Trauma probably affects the hair papillae by producing a slight hemorrhage at the base of the follicles which is not visible clinically.

Neuroendocrine Imbalance

Fifteen patients had signs suggesting disturbances of the vegetative nervous system: 2 cases, dyshidrosis; 4 cases, pompholyx; 1 case, lichen planus; 5 cases, chronic neurodermatitis; 1 case, nail biting; 2 cases, gastric ulcer. In none was there any clinical evidence of hyperthyroidism, although basal metabolic rates were routinely ordered.

Nail Changes

In 12 cases there were nail disorders which appeared shortly after the alopecia. These consisted of pitting, 4 cases; longitudinal striation, 5 cases, and onychorrhexis, 3 cases.

Association with Leukoderma

Associated depigmentation in the affected area appearing at the time of the hair loss was noted in 4 cases. One case of leukoderma appeared a year after onset of the alopecia. We were unable to trace these patients, so the outcome is not known.

Relapse Rate

Of the 73 patients followed, 26 (36 per cent) had relapses, 13 after 2 months, 8 after 3 months, 2 after 12 months, 1 after 3 years, 1 after 4 years and 1 after 10 years. In Anderson's series the relapse rate was 28 per cent, in Walker and Rothman's, 85.8 per cent (average follow-up, 14.2 years).

Failure of Regrowth

In 5 cases the hair failed to regrow in spite of vigorous treatment. One of these cases was of the ophiasic type in an adult, and the

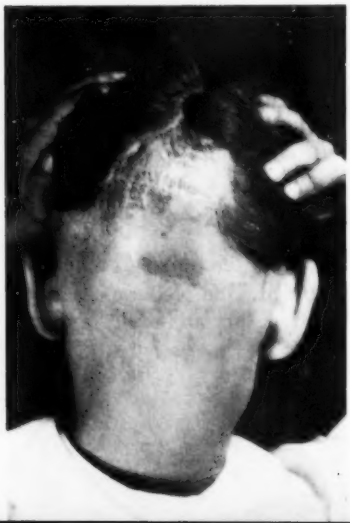
FIGURE 1. An average case of alopecia areata in a woman of 25 with complete regrowth of hair after 6 months.

FIGURE 2. This patient developed alopecia areata after a fall from a horse.

FIGURE 3. The band-like type which is often resistant to therapy.

FIGURE 4. The temporofrontal type with involvement of the eyebrow.

FIGURE 5. Severe occipital type; cortisone was used to stimulate hair growth.



others were in children. In one case in which 4 patches occurred, the alopecia was permanent in one of the patches.

Prognosis

The relapse rate was higher in the neurotic type of patient. If no regrowth occurs after a year, prognosis is poor. Alopecia areata of the bearded area and of the forearms required three times as long for regrowth to occur as did that of the scalp. Alopecia areata occurring before puberty may develop into the totalis type. In general the prognosis should be guarded in the rapidly spreading type, cases more than a year in duration, the extensive type with involvement of the bearded area or extremities, and cases with nail involvement.

Treatment

While hair growth may occur spontaneously, in my opinion local and general therapy hastens regrowth. Although there is no specific treatment, the following procedures may stimulate the return of hair, prevent further loss and improve the patient's morale:

1. *Physiotherapy.* Erythema doses of ultraviolet light or spot quartz, once a week to the affected area. In resistant cases Feeny[5] has found thorium-X ointment or varnish useful.

2. *Cryotherapy.* Production of erythema by use of solid carbon dioxide snow or slush.

3. *Local irritants.* Any rubefacient which produces local irritation will cause local hyperemia and hasten physiologic regrowth of hair. My preference is phenol-alcohol,* Cutler's solution or 7 per cent tincture of iodine.

4. *Amino acid therapy.* Supply amino acids containing cystine.

5. *Diet.* Foods containing cystine.

6. *Vascular dilation.* This can be produced by estrogens or acetylcholine iontophoresis.

7. *Vitamin therapy.* Vitamin A in doses of 150,000 units daily.

8. *Psychotherapy.* In all cases the physician should improve the patient's morale by being hopeful and by encouraging him to return once a week for treatment until there is evidence of hair growth. If the patient is definitely depressed or if the alopecia cannot be hidden, a wig or transformation should be advised.

9. *Propyl thiouracil.* This has been used in cases in which the metabolic rate is elevated.

10. *Sedative drugs* such as DONNATOL® or BARBIDONNA® may be useful in the worried type of patient.

11. *Corticotropin.* In those cases in which there is no response to local or general therapy after a month, a course of cortisone (25 mg. every 6 hours for a week, if not contraindicated) may stimulate hair growth. In the alopecia totalis type, the effect of this hormone has unfortunately been only temporary, although it appears that one or more of the adrenal corticosteroids have an important bearing on hair growth.

I have found general ultraviolet radiation to the scalp and phenol-alcohol applied to the patches once a week satisfactory in the average case. When there is no evidence of hair growth after 3 months, other measures are advisable.

It is only fair to state that some investigators are opposed to treating the condition for the following reasons: (1) The disease is self-limited; (2) treatment may prolong the disorder by focusing attention on the psychosomatic mechanism, and (3) simple reassurance may produce as good results, according to Arnold,[6] as a course of local treatments. The average American patient, however, requires more than words to relieve his or her anxiety and impatience.

*Liquid phenol is applied to the patch until it turns white, and is immediately neutralized with alcohol.

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CLINICAL STUDY

Passive Transfer Tests As An Aid In Persistent Bronchial Asthma

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Passive transfer tests are helpful in ascertaining the etiologic factors in patients with severe allergic symptoms due to asthma and other allergic disorders. The majority of these patients are receiving antihistaminic drugs and ADRENALIN®, *which interfere with the direct positive skin tests. Etiologic factors will be uncovered which do not appear on direct skin tests, and the results of therapy will be gratifying.*

FOR practical purposes the different types of bronchial asthma may be divided into 3 major categories:

1. Patients who have the frankly allergic type of asthma and in whom positive skin tests and eosinophilia in the sputum and blood can be demonstrated. These patients usually are in the younger age groups.

2. Patients usually past 50, although not necessarily so, who give no family history of allergy, in whom skin tests are negative and in whom the asthma is preceded by frequent attacks of upper respiratory infections, perennial rhinitis, or an attack of pneumonia.

3. Patients in whom there is an element of the previous 2 types with various degrees of dominance of one or the other.

Recently there has been a marked trend on the part of certain allergists to magnify the importance of psychosomatic and psychogenic factors in the etiology of asthma. It has been our experience, over a number of years in a large series of patients, that neurogenic and psychogenic factors are by themselves only contributory or accessory causes and do not alone provoke attacks of bronchial asthma.

We have always believed that it is of prime importance to study the patient thoroughly with every method at the disposal of the allergist, starting with a careful, detailed, exhaustive history, laboratory studies, x-ray and fluoroscopy of the chest, complete scratch and intradermal tests, and finally the method of passive transfer.

SAMUEL J. TAUB

HAROLD W. ROSENBERG

The technic and value of skin tests are generally known to the profession, but the passive transfer method of testing (Prausnitz-Küstner) is little known and probably not used, even by allergists. The results and information which can be secured from this method far outweigh any technical difficulties. The

technic of passive transfer is as follows:

1. Ten cubic centimeters of venous blood is drawn from the patient and centrifuged by high speed.
2. Kahn test is done on the serum.
3. A nonallergic recipient is then selected and 0.1 cc. of serum from the patient is injected into the outer surface of the arm. From 20 to 30 such injections can be given using both arms. It is important to outline each site with an indelible pencil.
4. Forty-eight hours after the injection of the patient's serum into the normal skin, one may test with various important foods and inhalants, by scratch or intradermal test, the sites into which the suspected serum was introduced.
5. A control should always be run by skin testing one of these areas with normal saline.
6. The appearance of a wheal indicates that the patient has a sensitivity to that pollen or substance.

From a large series we have selected a typical patient who demonstrates ideally the value of passive transfer studies in evaluating the etiology of bronchial asthma.

The patient is an 18 year old white, female, high school student. There is no history of allergy in the immediate family (father, mother, sisters and brothers). One first cousin on the paternal side has a history of asthma. The patient was first seen February 14, 1953 with the following history:

Her first attack of dyspnea, wheezing, cough and expectoration began in September 1951. It persisted for 2 weeks and cleared up with bed rest and oral medication only. She had no further attacks until January 1, 1953. At that time she had a series of bronchial asthmatic attacks which were so severe and persistent that she had to leave school. At first she was confined to bed and given cortisone (1 tablet 3 times a day) for 3 days and adrenalin-in-oil injections, but no further relief was obtained after the third day.

On February 14, 1953 she was referred to us for consultation. Examination showed a well-developed young girl who was wheezing and coughing. On auscultation, there was wheezing throughout the chest with sibilant and sonorous rales over both bases, particularly on expiration. The expiratory phase was greatly prolonged. Fluoroscopy of the chest revealed widened intercostal spaces, emphysema with increased aeration throughout and depressed diaphragmatic arches. There was marked pallor of the nasal mucosa, and nasal smear revealed numerous eosinophils.

She was to return for further allergic study but had another severe attack of asthma and on February 18 was hospitalized for 2 weeks by her own physician. While in the hospital her treatment consisted of chloral hydrate by mouth, aminophylline suppositories twice daily, and adrenalin-in-oil by injection p.r.n. but at least once daily. Cortisone was not administered at this time. Under this regimen she made no progress, and when she was told that she would have to be in the hospital 4 to 6 weeks longer for further observation, she left the hospital and returned home. She continued the therapy at home, using the aminophylline suppositories every morning and night, with her mother administering the adrenalin-in-oil. However, the asthmatic attacks continued.

On March 17, 1953 she returned to this office where complete intradermal tests were done with the following results:

House dust 2+	Rye 2+
Rabbit hair 2+	Ginger 3+
Goat hair 2+	

With no improvement in her condition, passive transfer studies were made on April 6, using her mother who was nonallergic. Following are the results of these studies in which major foods and inhalants were used:

Yeast 4+	Molds 4+
Tomato 4+	50% *Hormodendrum*
Feathers 2+	50% *Alternaria*

As a result of these findings all products containing yeast and tomato were eliminated from her diet. Feathers were also completely eliminated.

On April 13 hyposensitization to dust and molds was begun. Since that date there has been a complete cessation of asthmatic attacks. The patient has gained 8 pounds in weight and is once again able to sleep through the night. She has resumed her normal social

life. Mainly, she has confidence that when she leaves her home she no longer need fear a bronchial asthmatic attack.

Conclusions

1. Without the aid of passive transfer studies it probably would not have been possible to control the patient's asthma.

2. It is a well known fact that the antihistaminic drugs and Adrenalin interfere with positive skin tests.

3. This case emphasizes the importance and value of passive transfer studies on patients of this type who give few positive skin reactions and who continue to do poorly on allergic therapy, because only part of the etiologic factors were ascertained prior to the passive transfer studies.

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NEW BOOKS RECEIVED

New books received are acknowledged each month. As space permits, books of principal interest to our readers will be reviewed more extensively. Reviews and additional listings will be found in this issue starting on page A-74.

Year Book of General Surgery. Edited by Evarts A. Graham, M.D., Emeritus Professor of Surgery, Washington University School of Medicine, St. Louis, Missouri, with a Section on Anesthesia, edited by Stuart C. Cullen, M.D., Professor of Surgery and Chairman of the Division of Anesthesiology, State University of Iowa College of Medicine and Hospitals, Iowa City. 590 pages with 150 illustrations. 1953, Year Book Publishers, Inc., Chicago. $6.00.

The Symptoms and Treatment of Acute Poisoning. By G. H. Lucas, Professor of Pharmacology, University of Toronto, Canada. 308 pages. 1953, The Macmillan Company, New York. $4.00.

Records and Reports of Local Health Departments; Public Health Monograph No. 15. By Olive G. Johnson, Chief Medical Record Librarian at the Clinical Center, National Institutes of Health. 89 pages. 1953, Public Health Reports, Washington, D.C. $.45.

Resuscitation of the Newborn. By Joseph D. Russ, M.D., Assistant Professor of Pediatrics, Tulane University School of Medicine, New Orleans. 55 pages with 7 illustrations. 1953, Charles C Thomas, Springfield, Illinois. $2.50.

Review of Physiological Chemistry. By Harold A. Harper, Ph.D., Professor of Biochemistry, University of San Francisco. Ed. 4. 329 pages. 1953, Lange Medical Publications, Los Altos, California. $4.00.

Surgery of the Biliary Tract, Pancreas & Spleen. By Charles B. Puestow, M.D., Clinical Professor of Surgery, College of Medicine and Graduate College, University of Illinois, Chicago. Illustrated by Jessie W. Phillips. 370 pages, illustrated. 1953, The Year Book Publishers, Inc., Chicago. $9.00.

Diseases of Women. By Robert James Crossen, M.D., Assistant Professor of Clinical Gynecology and Obstetrics, Washington University School of Medicine, St. Louis, Missouri. Ed. 10. 935 pages with 990 illustrations. 1953, C. V. Mosby Company, St. Louis, Missouri. $18.50.

Vitamin Manual. Foreword by Norman Jolliffe, M.D. 90 pages, illustrated. 1953, The Upjohn Company, Kalamazoo, Michigan.

Peripheral Nerve Injuries; Principles of Diagnosis. By Webb Haymaker, M.D., Chief, Neuropathology Section, Armed Forces Institute of Pathology, Washington, D.C., and Barnes Woodhall, M.D., Professor of Neurosurgery, Duke University School of Medicine, Durham, North Carolina. Ed. 2. 333 pages with 272 illustrations. 1953, W. B. Saunders Company, Philadelphia and London. $7.00.

An Atlas of Pelvic Operations. By Langdon Parsons, M.D., Professor of Gynecology, Boston University School of Medicine, and Howard Ulfelder, M.D., Assistant Clinical Professor of Gynecology, Harvard Medical School, Cambridge, Massachusetts. 231 pages, illustrated. 1953, W. B. Saunders Company, Philadelphia and London. $18.00.

Spatial Vectorcardiography. By George E. Burch, M.D., Henderson Professor of Medicine, J. A. Abildskov, M.D., Instructor in Medicine and James A. Cronvich, M.S., Professor of Electrical Engineering, Tulane University, New Orleans. 173 pages with 121 illustrations. 1953, Lea & Febiger, Philadelphia. $5.00.

Planning Guide for Radiologic Installations. By the Committee on Planning of Radiologic Installations of the Commission on Public Relations of the American College of Radiology, Chicago. Chairman Wendell G. Scott, M.D., Associate Professor of Clinical Radiology, Washington University School of Medicine, St. Louis, Missouri. 336 pages, illustrated. 1953, Year Book Publishers, Inc., Chicago. $8.00.

SCIENTIFIC EXHIBIT

The Prevention of Rheumatic Fever

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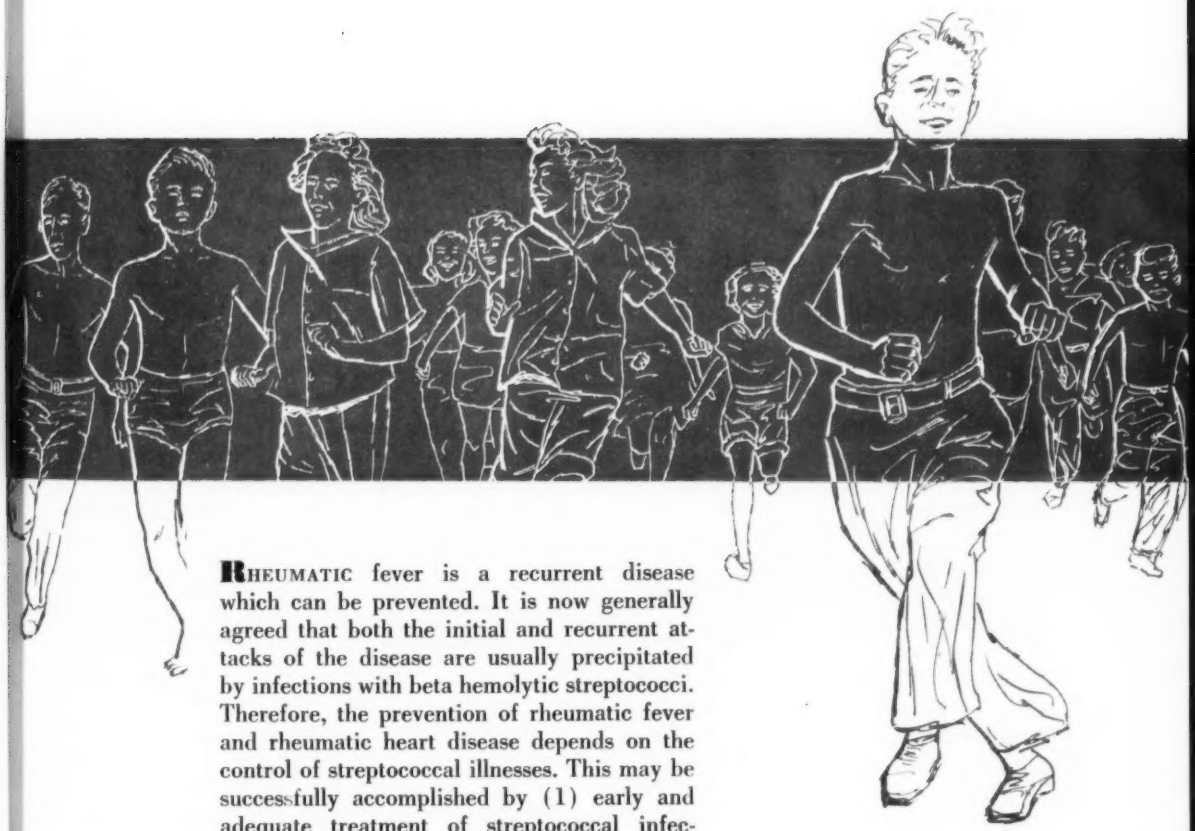
JOHN P. HUBBARD AND BURTIS BREESE

Council on Rheumatic Fever and Congenital Heart Disease, American Heart Association, New York



RHEUMATIC fever is a recurrent disease which can be prevented. It is now generally agreed that both the initial and recurrent attacks of the disease are usually precipitated by infections with beta hemolytic streptococci. Therefore, the prevention of rheumatic fever and rheumatic heart disease depends on the control of streptococcal illnesses. This may be successfully accomplished by (1) early and adequate treatment of streptococcal infections in all individuals and (2) prevention of streptococcal infections in rheumatic subjects.

Beta hemolytic streptococcal colonies are usually small and round. On a blood agar plate there will be a large area of hemolysis about the colony.

A slide made from one of these colonies will show the characteristic chains of cocci. However, this procedure is time consuming and so delays the initiation of therapy.

TREATMENT OF STREPTOCOCCAL INFECTIONS

In the general population at least 3 per cent of untreated streptococcal infections are followed by rheumatic fever. Among certain individuals, especially those with previous rheumatic fever, the incidence is much higher. Adequate and early penicillin treatment, however, will prevent most attacks of rheumatic fever and eliminate streptococci from the throat.

Diagnosis of Streptococcal Infection

In most instances it is possible to recognize streptococcal infections by their clinical manifestations, but laboratory tests may assist in establishing the diagnosis.

Epidemiology

The seasonal pattern and presence of similar cases in the community or household may be helpful. For example, streptococcal infections in the northern United States are most common from January through June. Likewise, a case of scarlet fever in one child would suggest that a sore throat in another has the same etiology.

Symptoms

1. Sore throat—onset sudden, in the tonsillar area, not in the trachea.
2. Headache—common.
3. Fever—variable—but generally from 101° to 104° F.
4. Abdominal pain—common, especially in children. Not too common in adults, but does occur.
5. Nausea and vomiting—common, especially in children.
6. These symptoms are usually *not* present:
   a. Simple coryza.
   b. Cough.
   c. Hoarseness.

Signs

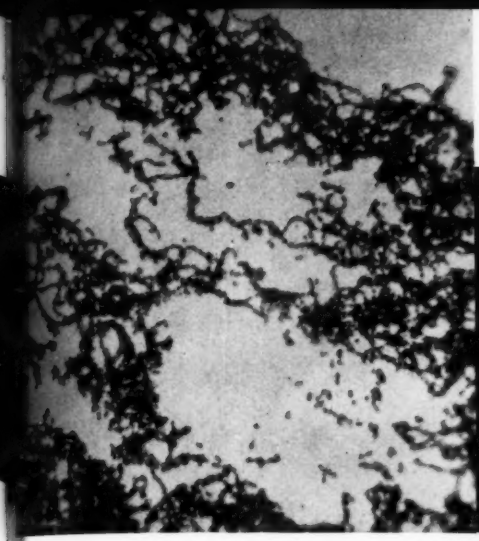
1. Red throat—frequently beefy red, but if seen early the redness may be mild.
2. Exudate—usually present.
3. Glands—swollen, tender tonsillar glands at angle of jaw.
4. Rash—scarlatiniform (characteristic of scarlet fever—not common).
5. Discharge—otitis media and sinusitis indicated by (serous or purulent) aural or nasal discharge are frequent complications of streptococcus pharyngitis.

Laboratory

1. White blood count—generally over 12,000 and in children frequently over 20,000.
2. Throat culture—positive for hemolytic streptococci.

Therapeutic Response

Almost without exception patients with streptococcal infections are vastly improved within 24 hours after penicillin has been



During the streptococcal season, especially in highly susceptible individuals, penicillin therapy may be initiated on the basis of a sore throat with exudate on tonsils.

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started and the temperature becomes normal, or nearly so.

This therapeutic response is characteristic, and if it does not occur the chances are much against the disease being due to hemolytic streptococci.

Treatment of Streptococcal Infections

In order to be effective, treatment should be started immediately when a streptococcal infection is suspected and continued for sufficient time to eradicate the streptococci from the throat.

Penicillin is the drug of choice for treating streptococcal infections.

Both the oral and the intramuscular routes of administration have been utilized successfully for penicillin therapy of streptococcal infections. Intramuscular injections have been proved to prevent rheumatic fever. The data on the value of oral penicillin as a preventive is less complete.

Oral administration in comparison with intramuscular administration has the following advantages:

It is not as distasteful to many patients.

It requires fewer physician visits.

It has these disadvantages:

Larger amounts of penicillin must be used.

It is difficult to administer to vomiting or refractory children.

In some adults it gives rise to persistent diarrhea and pruritus ani.

It is difficult to be sure that treatment is continued for sufficient time and given in proper relation to meals to be effective.

Recommended Treatment Schedules

Intramuscular Penicillin

1. Children—one intramuscular injection of 300,000 units of procaine penicillin with aluminum monostearate in oil *every third day for 3 doses.*
2. Adults—one intramuscular injection of 600,000 units procaine penicillin with aluminum monostearate in oil *every third day for 3 doses.*
   (Note: Less preferable, but usually effective—2 doses as above at three day intervals.)

Oral Penicillin

1. First five days: 200,000 to 300,000 units one-half to one hour before meals and at bedtime (total of 800,000 to 1.2 million units per day in 4 divided doses. The lesser amount for children; the greater amount for adults).
2. Second five days: 200,000 to 250,000 units one-half to one hour before meals (total 600,000 to 750,000 units per day in 3 divided doses).
   (Note: To be effective, therapy should be continued for the entire 10 days even though the temperature may return to

normal and the patient may feel better within one or two days.)

Combination of Intramuscular and Oral Penicillin

Therapy may be begun with one injection of penicillin (300,000 units procaine penicillin with aluminum monostearate in oil) and then, beginning three days after the injection, continued for an additional seven days with oral penicillin according to schedule 2.

Other Medication

1. AUREOMYCIN® is less effective than penicillin in controlling streptococcal infection but is especially useful in those sensitive to penicillin.
   Dosage: Total 10 mg. per pound of body weight in 4 divided doses daily for two days. Cut dose in half for remaining eight days of therapy.
2. New preparations of penicillin: These may be effective and even preferable to the treatment schedules outlined, but at present they have not had sufficient trial to warrant their recommendation.
3. Other antibiotics: At present there are inadequate data on their value.

Not Recommended for Treatment

1. Penicillin troches or lozenges.
2. Penicillin followed by sulfonamides.
3. Sulfonamide drugs.

(Note: Recurrences of streptococcal infection should be treated as primary attacks.)

PREVENTION OF STREPTOCOCCAL INFECTIONS

General Rules for Prophylaxis

Who should be treated?

All individuals under the age of 18 who have had rheumatic fever or chorea and all those over this age who have had an attack within five years.

When should prophylactic treatment be initiated?

(Note: In patients receiving ACTH or cortisone, be cautious that other infections are not masked since the prophylactic dose is inadequate to treat such concurrent illnesses as pneumonia or meningitis.)

At the end of the second week of the attack of rheumatic fever or any time thereafter when the patient is first seen. Prior to the start of prophylaxis, beta hemolytic streptococci should be eradicated by proper treatment of the patient.

(See methods of penicillin therapy recommended above.)

How long should prophylaxis be continued?

In children, at least to the age of 18; in all those above this age, for at least five years from their last attack.

Should prophylaxis be continued during the summer?

Yes.

Prophylactic Methods

Sulfadiazine

This drug has the advantage of being easy to administer, inexpensive and effective (other newer sulfonamides are probably equally effective). Although resistant streptococci have appeared during mass prophylaxis in the armed forces, this is rare in civilian populations.

1. Dosage: from 0.5 to 1.0 gm. taken each morning throughout the year. The smaller dose is to be used in children weighing less than 60 pounds.
2. Toxic reactions are infrequent and are usually minor. However, in any patient being given prophylaxis with sulfonamides, consider all rashes and sore throats as possible toxic reactions to the drug, especially if they occur in the first eight weeks of prophylaxis. The chief toxic reactions are:
   a. Skin eruptions.
      (1) Morbilliform—much like measles—continue to give the drug with caution.
      (2) Urticarial—best discontinue treatment.
      (3) Scarlatiniform—often associated with sore throat and fever. Unsafe to continue drug.
   b. Blood reactions.
      Leukopenia—Discontinue if white blood count falls below 4000 and

polynuclear neutrophils below 35 per cent because of possible agranulocytosis which is often associated with sore throat and a rash. Because of these reactions, weekly white blood counts are advisable for the first two months of prophylaxis. (The use of sulfonamides *therapeutically* for any reason in this period should be preceded by a white blood count.) The occurrence of agranulocytosis after eight weeks of continuous prophylaxis with sulfonamides is extremely rare.

Penicillin

Although experience with oral penicillin for prophylaxis of rheumatic fever is more limited than that with the sulfonamides, the antibiotic promises to be a safe and effective prophylactic agent. Oral penicillin has the desirable characteristics of being bactericidal for hemolytic streptococci and of rarely producing serious toxic reactions. It has the disadvantages of being more costly than sulfadiazine and because of the need of giving it on an empty stomach, of being somewhat more difficult to administer. Oral penicillin represents an alternative drug for rheumatic fever prophylaxis. It is especially important to use this agent for those who do not tolerate sulfadiazine.

1. Dosage.

   Although other routines of administration may prove satisfactory, the following schedules are suggested:

   200,000 to 250,000 units twice daily is recommended. Since penicillin is best absorbed on an empty stomach, the time of administration should be one-half to one hour before a meal or at bedtime. A single dose of 200,000 to 250,000 units before breakfast is less preferable.

2. Toxic reactions.
   a. Urticaria.
   b. Reactions similar to serum sickness—they include fever and joint pains and may be mistaken for rheumatic fever.
   c. Angioneurotic edema.

   Although many individuals who have had reactions to penicillin can subsequently take the drug without trouble, it is safer not to use penicillin, if the reaction has been severe and particularly if angioneurotic edema has occurred.

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GENERAL PRACTICE *Review*

This department offers the latest, proved methods for the treatment and management of commonly encountered conditions based on the extensive experience of the physicians who prepare these summaries for POSTGRADUATE MEDICINE.

Clinical Vectorcardiography

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STEPHEN R. ELEK

ALL living tissue has an electric charge. This is recorded from the brain, for example, by the electroencephalogram, and from the heart by the electrocardiogram. The latter records electromotive force from the heart by a stylus writing on special paper. In the vectorcardiogram (abbreviated to VCG), the electromotive force of the heart activates a cathode ray tube so that a "loop" is formed and seen on the face of the oscilloscope. This loop is photographed and permanent records are made. Therefore, the vectorcardiogram differs primarily from the electrocardiogram in the manner of recording cardiac potential.

There are two types of vectorcardiograms:

1. Indirect: The vector loop is calculated from the conventional electrocardiogram.
2. Direct: The vector loop is recorded by the oscilloscope.

This presentation is confined to the direct vectorcardiogram.

Mode of Electrode Placement

Two methods are commonly employed, namely, the "cube" method and the "tetrahedron" method. In the cube method, electrodes are placed on the chest on a level with the second lumbar spine in the right anterior, right posterior and left posterior axillae; the fourth electrode is placed just above the right scapula. Another electrode is placed on the right leg as a ground. In the tetrahedron method, the electrodes are located on the right arm, left arm and left leg (as in electrocardiography) and the fourth electrode is placed on the back 3 cm. to the left of the seventh dorsal vertebral spine. A ground electrode is also used. The author has had more experience with the cube system of Duchosal and Sulzer with polarity as modified by Grishman.

The presentation and illustrations in this review are confined to the cube system which consists of three planes: the horizontal, frontal and sagittal planes. The anatomic orientation

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for each plane is shown in the illustrations. Actually, this orientation is three dimensional just as a chest x-ray is visualized as three dimensional, although it appears to be one dimensional. The three dimensional aspect applies primarily to the chest cavity and the orientation refers to the anterior or posterior, superior or inferior, and left or right or combinations thereof. Because of this three dimensional aspect, the vectorcardiogram is termed a spatial (direct) vectorcardiogram.

Components of a Vector Loop

The white dot seen in figure 1 is called the E point and corresponds to the isoelectric intervals of the electrocardiogram such as the P-R and T-P intervals; the vector loop begins and ends at the E point. The vector loops in the illustrations are not solid lines because they are interrupted by some appropriate means (such as a tuning fork) in order to facilitate the determination of the direction of the loop. In figure 5 the interrupted lines have the appearance of a teardrop, the tail of which indicates the direction of the loop. By direction of the loop is meant clockwise or counterclockwise movement which can be visualized on the face of the oscilloscope. Every vector loop has a limb which leaves the E point (outgoing or centrifugal limb) and a limb which returns to the E point (returning or centripetal limb). The spatial orientation of these limbs depends on the plane being studied and the direction of the vector loop. Thus, in the normal heart (figure 1) in the horizontal plane, the outgoing limb projects anteriorly and the returning limb projects posteriorly.

The P and T waves of the electrocardiogram also form P and T vector loops, which are not always clearly seen since they are frequently fused with the E point (horizontal plane of figure 1). One instance of a fairly open T wave vector loop occurs in the frontal plane of figure 6. The P and T wave vector loops will not be considered in this discussion.

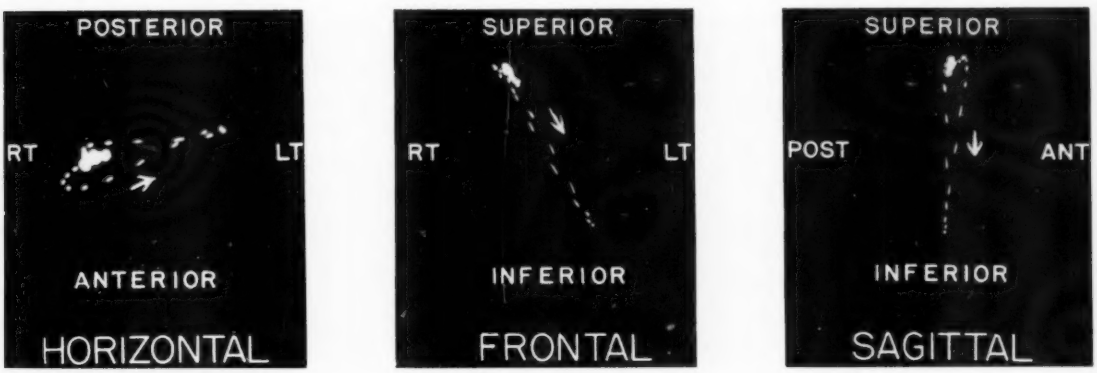

FIGURE 1. Vectorcardiography in a normal 30 year old woman with clinically normal heart. The arrows indicate the direction of the QRS vector loops.

Derivation of Electrocardiogram from Vectorcardiogram

The precordial leads are derived from the

horizontal plane, the limb and aV leads from the frontal plane, and the esophageal leads from the sagittal plane.

The QRS complex may be derived from the vector loop in a simple way. Draw a straight line through the E point in the direction of the electrocardiographic lead under consideration; draw a dotted line perpendicular to the first line but also through the E point. This procedure divides the vector loop into relatively positive and negative fields with regard to the electrode. This is illustrated schematically in figure 2 for lead V_2 and in figure 3 for lead V_6. That portion of the vector loop moving predominantly toward the electrode is positive and produces an upward deflection; that portion of the vector loop moving predominantly away from the electrode is negative and produces a downward deflection. If most of the vector loop is directed towards the electrode, then a tall R wave is written (figure 3); if most of the vector loop is directed away from the electrode, then a deep Q or S deflection is written (figure 2). After some experience one can tell by inspection of the vector loop the approximate amplitudes of the Q, R or S waves.

Similar reasoning is employed in the derivation of the limb leads, aV leads and esophageal leads except that Bayley's triaxial reference system is used.

An exact relationship between the QRS complex in the electrocardiogram and the QRS complex derived from the vectorcardiogram may not exist and is not expected. Incidentally, septal activation is thought to be represented in the earliest portion of the outgoing limb of the vector loop. The P-R and Q-T intervals cannot be measured in the vectorcardiogram. Elevation or depression of the ST segment is not easily depicted in the usual vectorcardiogram except by added amplification. The polarity of the T wave can be estimated by inspection of its vector loop. If its predominant direction is similar to that of the QRS vector loop, then it is positive or upright.

Spatial Position of the Vector Loop

The loop in any plane has a predominant

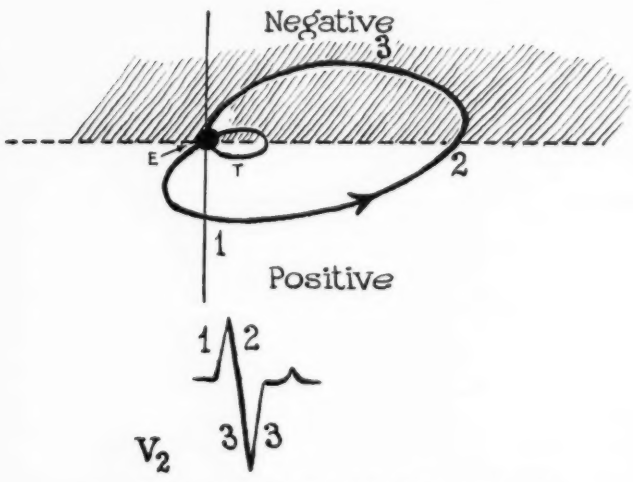

FIGURE 2. Schematic derivation of the QRS complex (the example is lead V_2) from the vectorcardiogram. The shaded area represents a relatively negative electrical field. Segments 1, 2 and 3 are approximately responsible for similarly numbered segments of the QRS complex.

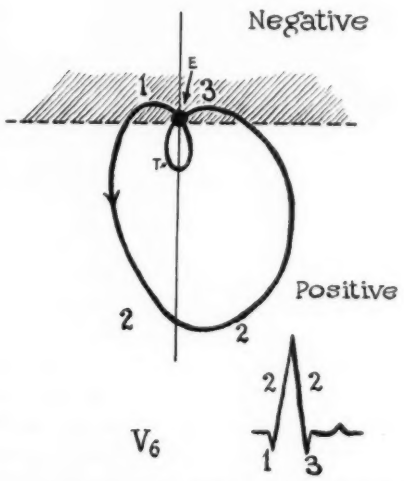

FIGURE 3. Schematic illustration of the derivation of lead V_6 from the VCG. The same derivation could be obtained by placing the electrode for position V_6 at point 2 of the vector loop in figure 2.

direction, which is indicated by the dotted line in figure 2. The location of the predominant direction can be described by utilizing the triaxial reference system, which divides a circle into 60° segments or a sextant. The first sextant comprises the area from 0° to −60° and the sixth sextant comprises the area from 0° to +60°. If the circle is divided into 30° segments, then 12 segments or octants exist. Sextants are advantageous in describing the vector loop position in any one plane and octants are used for the three planes. For example, the predominant direction of the horizontal plane vector loop in the normal heart may be described as being in the first or sixth sextants or in the plus or minus 30° area.

The anatomic position of the vector loops for each plane is labeled in the illustrations. The anatomic positions refer to the patient, that is, the patient's left, right, anterior, posterior, etc. These positions are easily remembered if they are compared with the positions obtained when the patient's chest is fluoroscoped. Figure 4 is a schematic representation of a horizontal plane vector loop in the normal adult heart. The outgoing (centrifugal) limb represents potential derived from approximately the anterior portion of the heart, and the returning (centripetal) limb represents potential obtained from approximately the posterior region of the heart. The junction of outgoing and returning limbs, which is quite variable, probably represents potential originating from approximately the lateral wall of the heart.

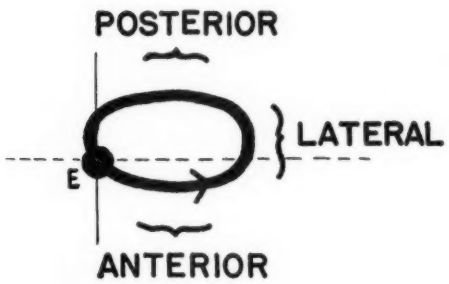

FIGURE 4. Sketch of a normal horizontal plane QRS vector loop and the anatomic designations. Compare this with the same plane in the other illustrations.

By mentally adding up the positions of the vector loops in the three planes, a three dimensional location or spatial vectorcardiogram is obtained. For instance, in the normal heart (figure 1), the spatial vector loop is almost entirely to the left (as judged from the horizontal and frontal planes), predominantly anterior (as judged from the horizontal and sagittal planes) and mostly inferior (as judged from the frontal and sagittal planes). Thus the spatial vectorcardiogram in the normal heart is described in shorthand fashion as being in the left anterior inferior octant.

The Vectorcardiogram in Various Clinical Conditions

Normal heart (figure 1)—The vector loops in the normal adult heart may be described as follows:

Horizontal plane: The vector loop is in the first or sixth sextants and is always counterclockwise in direction; it is usually not twisted.

Frontal plane: The vector loop is usually in the third and sixth sextants and may be clockwise or counterclockwise in direction. It is mostly inferior, i.e., most of the loop projects below the E point.

Sagittal plane: The vector loop is usually midway between anterior and posterior and sometimes predominantly posterior. It is most often inferior in position and usually clockwise in direction.

Figure 1 illustrates a normal vectorcardiogram in a young adult woman. The large cluster of white represents both the E point and the T wave vector loop seen on end.

Left ventricular hypertrophy (figure 5)

Horizontal plane: The vector loop is oriented more posteriorly in the first sextant than in the normal heart but the direction is still counterclockwise.

Frontal plane: The loop is oriented more to the left than in normal subjects and is often in the sixth sextant. It is usually inscribed counterclockwise.

Sagittal plane: The loop is more posterior

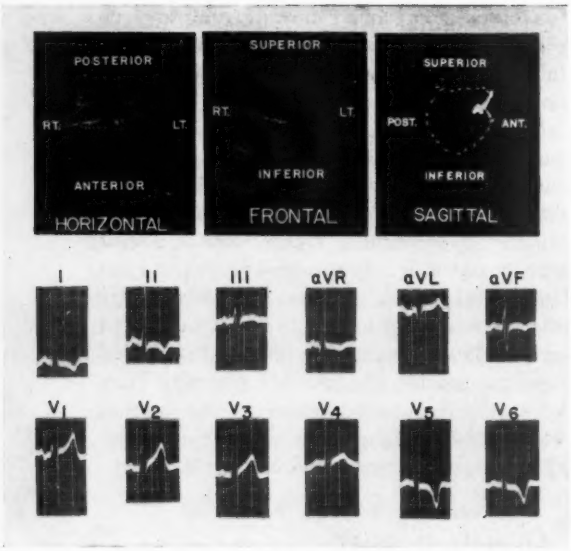

FIGURE 5. VCG in left ventricular hypertrophy. The time lines are teardrop shaped, the thin portion indicating direction of movement. This patient was not taking digitalis and probably has myocardial ischemia as well.

than normal and points to the fourth or fifth sextants.

The outstanding feature of this vectorcardiogram is the posterior orientation best seen in the horizontal and sagittal planes. This is consistent with anatomic findings since in left ventricular hypertrophy most of the left ventricle is posterior. It must be admitted, however, that the present criteria for the diagnosis of left ventricular hypertrophy by vectorcardiogram leave much to be desired.

Figure 5 illustrates a 40 year old woman with chronic hypertension (240/140) and with clinical evidence of left ventricular hypertrophy.

Right ventricular hypertrophy (figure 6)

Horizontal plane: The vector loop is mainly in the third, fourth or fifth sextants and the direction is clockwise. Most of the loop is oriented to the right.

Frontal plane: The loop is usually inferior, but as the degree of hypertrophy increases it becomes superior, as shown in figure 6. The direction is usually clockwise.

Sagittal plane: The loop is midway between the anterior and posterior position, but with increasing right ventricular hypertrophy it may become more anterior. The loop is inscribed either clockwise or counterclockwise.

The most significant change in this lesion is the rightward deviation and clockwise direction of the horizontal plane vector loop. The spatial position is in the right anterior inferior (or superior) octant.

Figure 6 illustrates a 3 year old boy with tetralogy of Fallot. The catheterization findings in this youngster showed a mean right ventricular pressure of 78 mm. of mercury and a right ventricular work level of 5.6 Gorlin units (the normal being 1.0 units).

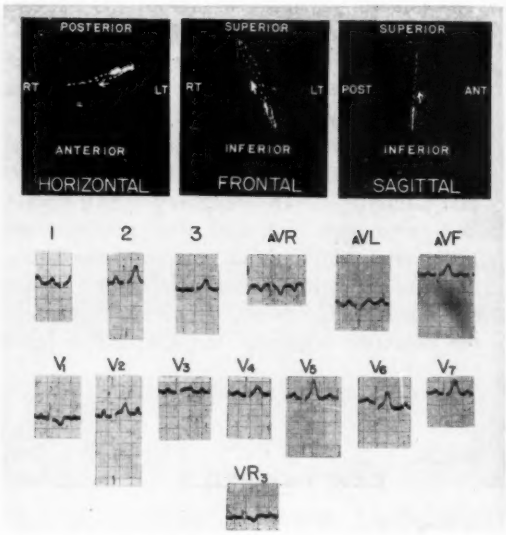

FIGURE 6. Typical right ventricular hypertrophy in a 3 year old boy with tetralogy of Fallot.

Bundle-branch block

A delay of impulse conduction is manifested in the vectorcardiogram by a bunching together or "clumping" of the time lines. The time markings are closer together than normal instead of being fairly evenly separated.

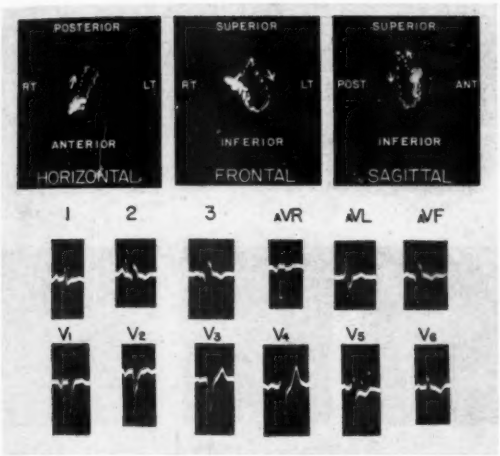

FIGURE 7. Left bundle-branch block (complete). Note the bunching of the time lines in the returning limb of the horizontal plane and inferior portion of the frontal and sagittal planes.

Such bunching must appear in at least two planes before the diagnosis of complete bundle-branch block can be made. This helps to distinguish a simulated appearance of clumping sometimes seen when a loop is twisted.

In complete left bundle-branch block (figure 7) the following important features are observed:

1. The bunching occurs after the initial loop.
2. Often there is no initial deflection to the right (in the horizontal plane).
3. The horizontal plane loop may be twisted and look like a figure-of-eight.
4. The vectorcardiogram is oriented more posteriorly and superiorly than in left ventricular hypertrophy.
5. The horizontal plane loop is clockwise.

All these features are illustrated in figure 7. The spatial position is usually in the left posterior superior octant. In complete atypical (Wilson) right bundle-branch block (figure 8) an important aspect is a terminal appendage in the horizontal plane to the right of the E point exhibiting bunching. In figure 8 this appendage is also seen in the frontal plane. In the horizontal plane this terminal appendage accounts for the prominent R′ deflections in right side leads (note rSR′ complex in V_1 and V_2) and the deep slurred S waves in left precordial leads (V_5 and V_6). This appendage in the frontal plane accounts for the prominent or slurred R wave in lead aV_R and slurred S wave in lead 1.

The spatial location is usually in the left anterior octant about midway between the anterior and superior position.

The vectorcardiographic appearance of partial incomplete bundle-branch block is not discussed in this report.

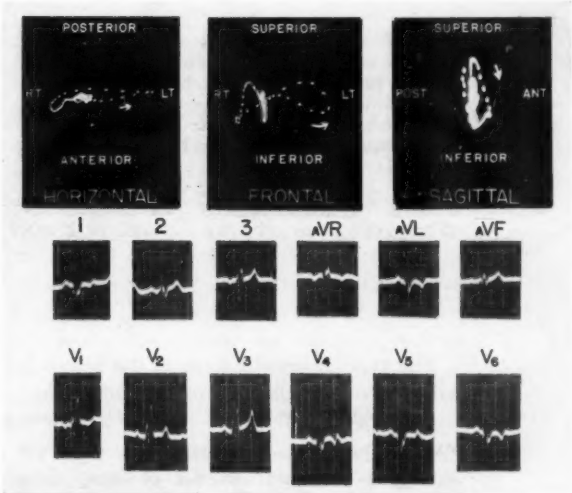

FIGURE 8. Right bundle-branch block (complete). Bunching of time lines is present in the terminal appendage of the vector loops in the horizontal and frontal planes.

Myocardial infarction

The dead or infarcted myocardial area does not produce electromotive force. This results in a decrease of potential and hence the vector loop deviates away from the damaged area and appears irregular or deformed.

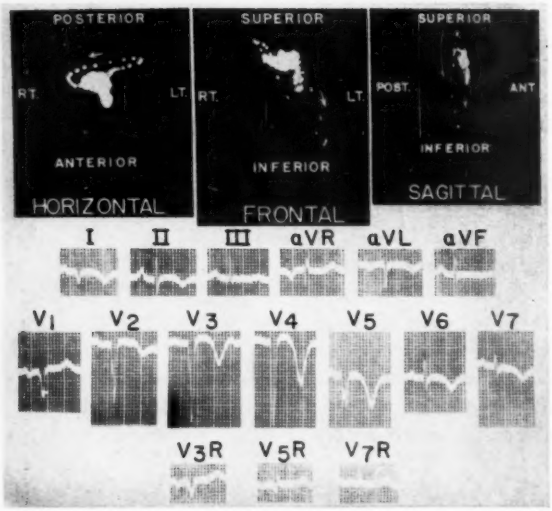

FIGURE 9 *(left)*. Anterolateral myocardial infarction. The vector loops are displaced posteriorly in both horizontal and sagittal planes. Compare with figure 1.

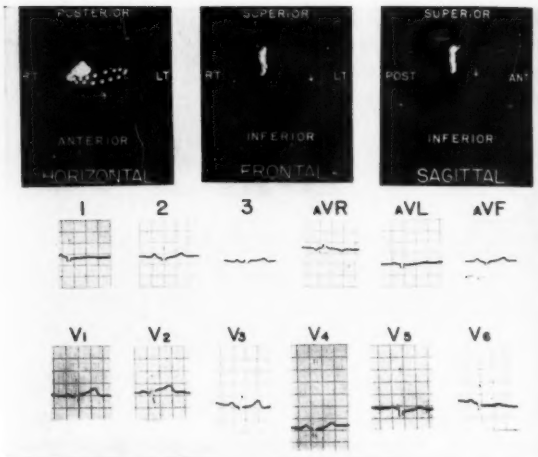

FIGURE 10 *(right)*. Posterior myocardial infarction. The vector loops are displaced anteriorly in both horizontal and sagittal planes. The electrocardiogram is not suggestive of infarction (except for the tall R wave in lead V_1) and the diagnosis is more readily made from the VCG.

The type of deformation of the vector loop will depend on the site of the infarction. In anterior wall infarction (figure 9) the outgoing limb of the horizontal plane loop is located posteriorly; in the sagittal plane a similar change is noted. Thus the vector loops in the horizontal and sagittal planes appear to be "pushed" posteriorly.

The opposite type of finding is noted in posterior wall infarction (figure 10). The returning limb of the vector loop in the horizontal plane deviates anteriorly and the sagittal plane loop has no posterior component, i.e., all of the loop is anterior to the E point. This is due to loss of potential on the posterior myocardial wall. Often, as seen in figure 11, the posterior limb of the horizontal plane loop is partially indented while the inferior portion of the frontal and sagittal plane loops is "scooped" out. This indicates the infarct is inferior and posterior in location. Bunching of the loops in the horizontal and sagittal planes (figure 11) indicates bundle-branch block even though the QRS complex is at the upper limit of normal (0.11 seconds). Most posterior wall myocardial infarcts examined vectorcardiographically occupy an inferior or diaphragmatic site. This is not a new concept inasmuch as such infarcts viewed at necropsy are situated in the lower third of the posterior left ventricular wall which is close to the diaphragm. The vectorcardiogram, however, affords a better way of visualizing this finding.

In figure 12 there is marked indentation of the terminal portion of the returning limbs of the vector loops in both horizontal and

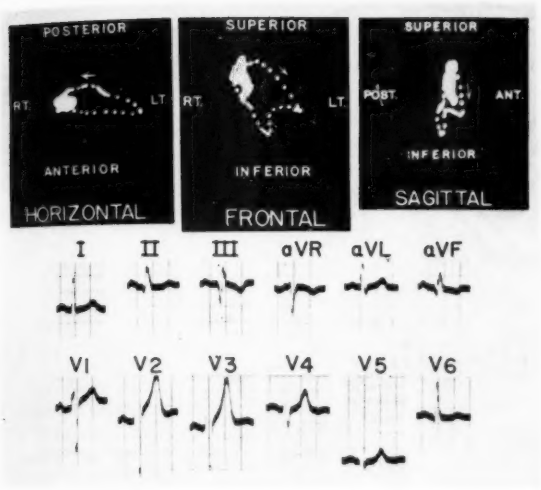

FIGURE 11. Postero-inferior myocardial infarction. Again, the VCG is not diagnostic of infarction but is abnormal.

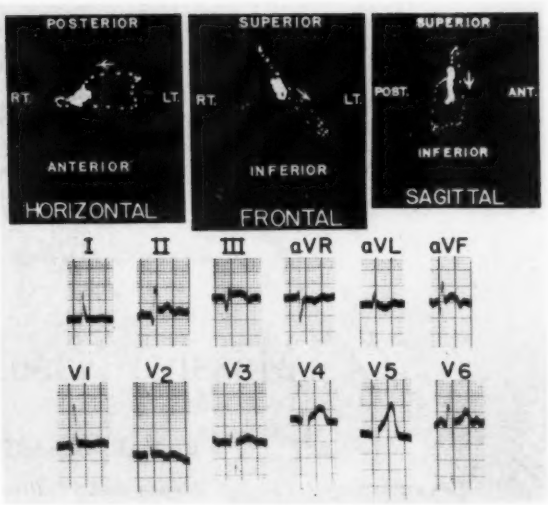

FIGURE 12. Posterolateral myocardial infarction.

sagittal planes and of the lateral portion in the horizontal plane. This suggests a posterolateral myocardial infarction.

Advantages of Vectorcardiography

In the present state of our knowledge the following advantages exist: (1) No memorization is needed for rather complete data, e.g., the height of the R or S wave in the various leads. (2) The concept of "electrical position" is not needed. (3) The effect of digitalis on the ST-T segment may confuse the diagnosis of left and right ventricular hypertrophy in electrocardiography but not in vectorcardiography. (4) The diagnosis of right ventricular hypertrophy is usually more easily made from the vectorcardiogram than from the electrocardiogram. In the infant, our studies indicate that the differentiation of "physiologic right ventricular hypertrophy," which is normal, from pathologic right ventricular hypertrophy can be made earlier and more satisfactorily in the vectorcardiogram than in the electrocardiogram. (5) The diagnosis of myocardial infarction, especially of the posterior wall, is often made earlier in the vectorcardiogram than in the electrocardiogram. (This statement is based, however, on our clinical experience and will require further proof). (6) The diagnosis of combined infarction and bundle-branch blocking is often more easily made in the vectorcardiogram than in the electrocardiogram. (7) Likewise the combined diagnosis of myocardial infarction and left ventricular hypertrophy is often more easily made from the vectorcardiogram than from the electrocardiogram.

Disadvantages of Vectorcardiography

(1) There is a lack of standardization with regard to system of recording, e.g., the cube system versus the tetrahedron (or other) system. (2) The study of cardiac arrhythmias is at present more advantageously done by electrocardiography. (3) Insufficient studies have been done in both the normal and abnormal heart, and with necropsy findings. This is merely a reflection of the fact that vectorcardiography is a young science. (4) At the present time insufficient studies have been done on the ST-T segments.

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Massive Nasal Bleeding

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A NOSEBLEED is seldom serious and usually easily controlled. However, it can be a fatal hemorrhage that is uncontrollable. This latter possibility is, fortunately, a rare one. More often a nosebleed may contribute to death by rendering the patient more susceptible to coronary occlusion, aspiration pneumonia, pneumonitis, etc.

Anatomy

The blood supply of the nose comes from both the external and internal carotid arteries. The external carotid artery branches into the internal maxillary artery, which in turn gives off the sphenopalatine artery and the descending palatine artery. The sphenopalatine artery has a lateral branch to the naso-antral wall and a medial branch, known as the nasopalatine artery, which descends on the septum to anastomose with the descending palatine artery coming up from the incisive foramen in the palate and forming the so-called "Kiesselbach's plexus" in "Little's area" (figure 1).

The internal carotid artery supplies the nose with two arteries, the anterior and posterior ethmoidal arteries which are offshoots of the ophthalmic artery (figure 2).

The source of bleeding in half the cases of nosebleed is the Kiesselbach's plexus, usually mild in children but often severe in adults. Most posterior bleeding is in adults and comes from the nasopharyngeal plexus under the posterior end of the inferior turbinate.

Etiology

The causes of massive epistaxis are many, but briefly they may be outlined as follows:

A. Trauma.

1. Direct blows to the nose and face usually cause bleeding from the anterior ethmoid artery due to lacerations of the anterior portions of the turbinates or from the nasopalatine as it passes down into Kiesselbach's plexus. Occasionally, one is confronted with a severe pulsating hemorrhage from the descending palatine artery as it comes up from the incisive canal. This latter is most common in steering wheel injuries where the anterior nasal spine has been fractured.

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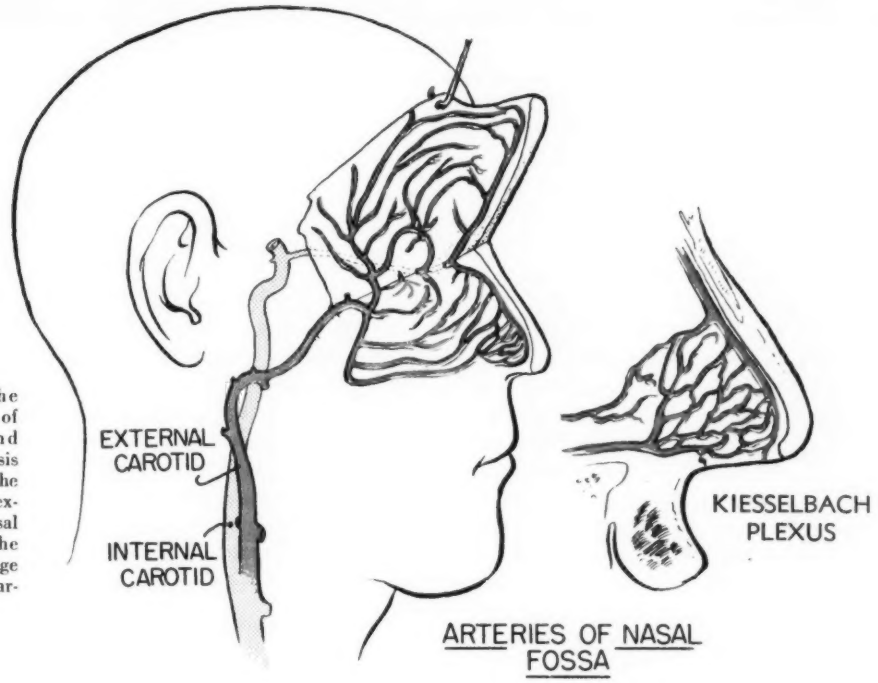

FIGURE 1. The blood supply of the nose and the anastomosis which forms the Kiesselbach plexus in the nasal vestibule. The venous drainage parallels the arterial system.

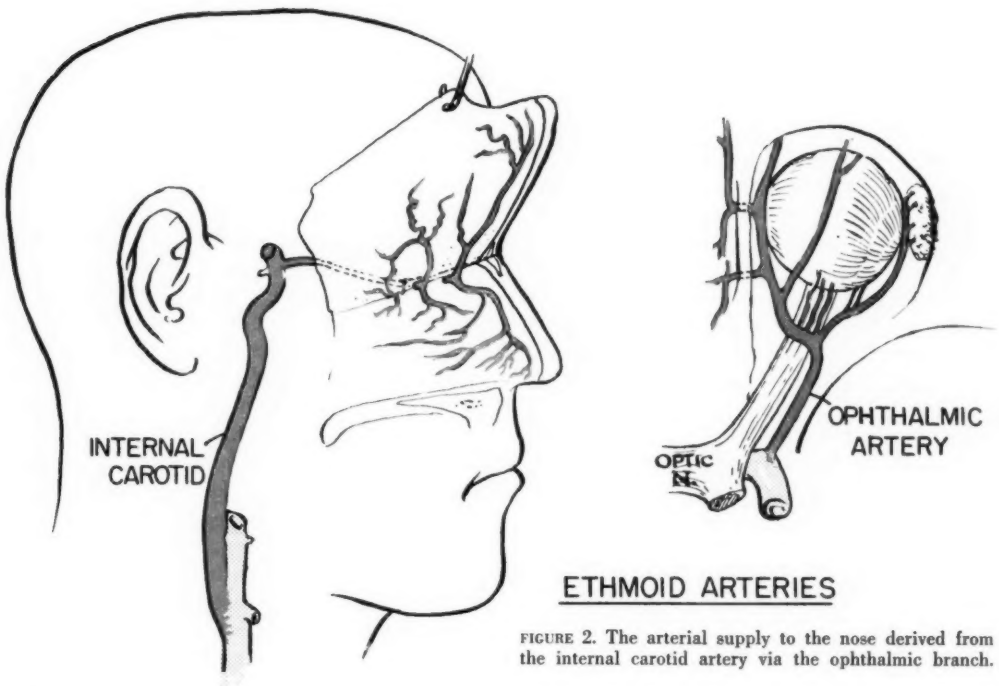

FIGURE 2. The arterial supply to the nose derived from the internal carotid artery via the ophthalmic branch.

2. Surgical injury most commonly causes bleeding of the vessels at their source. That is, the ethmoidal arteries are usually ruptured as they pass from the ophthalmic artery through the ethmoidal labyrinth, and the sphenopalatine is most commonly interrupted as it passes from the sphenopalatine foramen across the face of the sphenoid of the septum.

3. Epistaxis digitorum is caused by vestibulitis digitorum[1] and is by far the most common reason for nasal bleeding. These terms connote bleeding and inflammation of the nasal vestibule caused by digits or fingers. As a rule, children rub and pick their noses because of allergy and an itching nose. Adults on the other hand, and especially women, will wipe far up into the nasal vestibule beyond the mucocutaneous border and scrub the delicate nasal mucosa until it bleeds. Later it forms granulations and crusts, and a scar replaces the mucosa. Once these "nose-pickers" have achieved crusting, they have created something real to go up after—and the condition perpetuates itself! This finger-produced ulcer may eventually erode through the septum and cause a perforation. Some of us have seen this process many times.

It is the established practice to cauterize the Kiesselbach plexus on the septum, which commonly bleeds from this type of nose-picking and wiping. It is thought that cauterizing effectively destroys the bleeding vessels and prevents further epistaxis. However, it is my belief that more often the cauterizing agent, whether chemical or electrical, simply makes the nose so terribly sore and tender that the "chronic nose-picker" leaves it alone long enough to heal spontaneously. The actual destruction of the blood vessel is irrelevant.[1]

4. Septal perforation due to infection is another cause of bleeding.

B. Neoplasms of great variety may occur in the nose and cause bleeding.

1. The blood dyscrasias can certainly cause nosebleed, usually by impairing the clotting ability of the blood.

2. This is true of multiple myeloma, too, although we have recently seen a patient who had a massive epistaxis from a tumor mass which was a lesion of multiple myeloma involving the cribriform plate and ethmoid bone.

3. Carcinoma causes bleeding *late* and is not an early symptom of the disease in the nose.

4. Hemangiomas usually occur in the two plexus areas.

C. Congenital lesions such as hereditary hemorrhagic telangiectasia, hemophilia, etc., are sometimes causes, but the most common congenital lesion is that of congenital heart disease. This may produce an increased venous tension and bleeding from either Kiesselbach's or the nasopharyngeal plexus.

D. Cardiovascular disease that is acquired, such as arteriosclerosis, hypertension, etc., may be added to the list.

Treatment

The first interest of the rhinologist is to treat the shock—the psychic shock and the cardiovascular shock, if any. Actual cardiovascular shock is unusual. It may be overlooked, however, because of normal blood pressure readings, when the patient actually has a marked drop from a very high blood pressure and is in a relative state of shock. Blood transfusions should be given for shock alone and not for mere nasal hemorrhage.

To appreciate fully the anxiety of a nosebleed, one must be called at 3:00 A.M. some morning and go to a patient's house. There you find a large, obese patient lying in a bed, damp and soggy, partly from melted ice and partly from blood. Her nightgown is spattered with blood. There is blood on the floor around a washbasin which is filled with clotted blood, and saturated tissues fill a paper bag. The patient is bug-eyed with fear, and standing around the bed, even more frightened, is one, two or three relatives, each of whom tries desperately to mop every drop, yes even every erythrocyte as it trickles from the upper lip.

Then comes the massive emesis! A large clot is propelled up from the stomach and into the basin. This swallowed blood is interpreted

by all as being the patient's spleen, liver or some other vital organ and an obvious peroral evisceration. This, of course, is an exaggerated and somewhat comic picture, but it testifies to the degree of psychic shock involved in this condition.

Under such circumstances as I have described, one should walk into the room and act as though he were completely oblivious to the blood, as though that huge basin of blood was mere spotting. Then take the blood pressure, pulse and listen to the heart. While the sphygmomanometer is still on the arm, slowly inject intravenously meperidine or codeine, the dose and drug as indicated. The patient relaxes. Don't burst into the room, look at the patient, gasp, and then frantically start stuffing VASELINE® gauze down the patient's nose. This type of heroic acting may be appropriate for the situation of an emergency tracheotomy. However, this approach to the patient with nosebleed, who is already paralyzed with fear, is only going to raise the blood pressure to a head-throbbing level.

The next step is to locate the source of the bleeding. If it is coming from the anterior portion of the nose, it can sometimes be observed by merely inspecting the nasal cavity with the nasal speculum. If it is escaping from the posterior part of the nasal cavity, then occasionally one may see the bleeding site by posterior rhinoscopy with the nasopharyngeal mirror through the mouth. However, in many cases it is futile to attempt to clean the nose with cotton pledgets or swabs, and the only way to clear the blood away and have an unobstructed view is with the use of suction. This, of course, requires transporting the patient to the office or to the hospital.

In this discussion of the treatment of nosebleeds, I shall not detail the technic of packing the nose, cauterizing, etc. This has been well covered by Beinfield;[2] I simply hope to outline some of the important points attendant to the various procedures in the management of such cases.

Anterior Packing

In the first place, think of the patient's discomfort and anesthetize the nose before jamming packs into the nasal cavity. If it is impossible to produce local anesthesia because of the bleeding, do not hesitate to give the patient a general anesthesia. Often one does the patient a great favor by putting him to sleep under endotracheal anesthesia and controlling the bleeding—the electrocoagulation can be more thorough and so can the packing.

Secondly, do not pack blindly. It may require temporary ADRENALIN® packs, suction or fracturing of a turbinate laterally to see the source of the bleeding, but blindly stuffing the nose with packs only further traumatizes the mucosa.

Finally, select the proper packing material. I find GELFOAM®, foam rubber, and Vaseline gauze unsuitable for hypertensive bleeders, because pressure cannot be achieved with these agents. Personally, for all-around use, I prefer plain gauze or iodoform gauze. With antibiotics, I prefer to leave the packs in until they are "ripe." That is, the exudate from the nose has changed from a serosanguineous one to a mucopurulent one. Then the packs may be removed without fear of recurrence of bleeding.

Posterior Packing

A postnasal pack is seldom needed but may be a most effective procedure. A similar effect may sometimes be achieved by packing into a finger cot or using an inflated balloon in the nasopharynx, such as with a Foley catheter.

Cauterization

Chemical cautery with something like the silver nitrate stick is often used for simple Kiesselbach's plexus bleeding; but where the bleeding occurs with considerable pressure, electrocautery or the use of a sclerosing agent must be used.

Surgical Procedures

One should not hesitate to perform a submucous resection in order to gain access to the posterior nasal cavity or to control bleeding from the septum.[3] When the hemorrhage is from a source posterior to a marked septal deviation, it is not wise to attempt to force packing past the obstruction. This only trau-

FIGURE 3. The distribution of the sphenopalatine artery as derived from the external carotid.

matizes the septum and adds to the bleeding.

Similarly, fracturing the inferior turbinates laterally is often helpful in gaining a better view of the nasopharyngeal plexus and the posterior tip of the inferior turbinate. It also often aids control of the bleeding by crushing and obliterating the vascular spaces in the turbinate mucosa.

Ligation of the external carotid artery is a procedure of definite value, but it is limited to those cases in which the bleeding is from the sphenopalatine artery or its branches. Furthermore, if it is a hemorrhage from the midline, it is less likely to be controlled by unilateral ligation (figure 3).

It is possible, too, to ligate the anterior and posterior ethmoidal arteries under those circumstances in which these vessels are the source of persistent bleeding.[4] They may be approached externally through the orbit and tied off with a minimum of trauma.

Summary

The management of epistaxis has been discussed. Stress has been laid on the importance of attending to the patient's psychic shock, the gentle manipulation of the nose, and purposeful nasal packing. The physician should not hesitate to employ various surgical procedures and general anesthesia, if other attempts at management have been traumatic or unsuccessful.

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Pediatrics IN GENERAL PRACTICE

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The Treatment of Flatfeet in Small Children

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THE type of flatfeet to be discussed in this paper is the common variety which is seen repeatedly by general practitioners and pediatricians. It will not include the congenital type of flatfoot which is like a reverse clubfoot. Neither will it include feet which are flat as the result of paralysis or other diseases.

J. H. KITE

In times past little attention has been given to the etiology of flatfeet. It was thought that the flatfeet were inherited or just happened. When a careful study is made of the sleeping and sitting habits of the infant, we find certain mechanical factors which could well be the cause of the flatfoot deformity.

In this study of the sleeping and sitting habits of small children, two patterns of deformity of the legs and feet occur. In one the baby sleeps on his stomach in the knee-chest position with his feet turned in, and when he sits he comes back on his feet with his knees flexed and his feet folded under him in a pigeon-toed position. This child will be slightly bowlegged and will walk pigeon-toed. This is not the pattern we will discuss.

In the second pattern, the baby also sleeps on his stomach, but his legs are spread out to the side in a spread-eagle or frog position (figure 1). Before birth he is floating in amniotic fluid. After birth he is placed on a firm mattress, and wears a new, stiff diaper which is too large for him. This holds his legs in 90° abduction. His flexed knees will rotate his legs laterally 90°. The same is true if he is placed on his back. During the first three or four months, when he is unable to turn by himself, this position is maintained day and night, except for the time he is held in arms. This position produces a fixed lateral rotation of the legs.

During the months he is in this position, certain changes are being forced on the feet. When he is on his stomach, the great toe rests on the mattress, and the foot is bent in the midtarsal joint to an abducted or flatfoot position. If he is placed on his back his legs are in this same position. The heel rests on the mattress, and the weight of the forefoot gradually bends the foot farther to a flatfoot position.

After the foot has been held in this ab-

FIGURE 1. Position in which a flatfooted child sleeps. The legs are abducted 90° at the hips. The flexed knees rotate the thighs laterally 90°. The weight of the lower leg and foot comes on the great toe, bending the foot in the midtarsal joint to a flatfoot position.

FIGURE 2. When the child is old enough to sit, he pushes back to an upright position, and sits with his knees still flexed and his feet by the sides of his hips. This is his "position of comfort." The pressure on the great toe still bends the foot into a flatfoot position.

FIGURE 3 *(right)*. The same child (figure 2) after he has begun t walk. There is an outward rotation of the legs in the hips so th the patellae point laterally. The feet not only turn out, but the fo foot is abducted in relation to the posterior foot. The longitudina arches are obliterated. The feet bulge in along the medial borde The heels are in valgus position. The imprints are those of flatfeet.

ducted position for months the peroneal muscles become contracted and the tibial muscles become stretched. The contracted muscles become stronger and the elongated muscles become weaker. In the flatfoot position, the peroneii pull in a straight line and work at a mechanical advantage. The tibial muscles have to pull from around the corner and work at a mechanical disadvantage. It is not surprising to see the baby pull the forefoot out and up in a calcaneovalgocavus position.

When the child is old enough to sit, he may sit tailor fashion with his legs crossed in front of him. In this position the legs are still held in outward rotation. The other position which many children prefer is with the knees flexed and the feet back by the sides of the hips (figure 2). The weight of the leg comes on the great toe, and the foot is again bent in the midtarsal joint with the forefoot abducted, holding the foot in a severe flatfoot position.

When the child begins to pull up and stand, he stands with the legs rotated laterally, and the feet in an extreme flatfoot position. At times the legs are rotated outward so far it seems that "one foot goes east and one foot goes west." When he is a little older he will walk with the legs in an outwardly rotated position (figure 3). Occasionally there may be a spontaneous correction of this condition, but many children retain the flatfoot deformity and are brought to the physician for treatment.

Treatment

Treatment should start with prevention. The infant should not sleep on his stomach or back, but on his side. When he is on his side the lower leg is flexed at knee and hip. The anterior surface of the thigh faces forward and is in normal relationship with the anterior surface of the body. There is neither medial nor lateral rotation of the leg. The same is true for the leg on top. To keep the baby on his side, it is necessary to put a small pillow or other support under his shoulder and hip. A small blanket rolled up and tied with strings is helpful. The baby is placed on alternate sides after each feeding. He is never placed on his back after a feeding because of the danger of regurgitation and

strangling. He is placed on his stomach when awake so that he may exercise.

When the child with outward rotation and flatfoot deformity is old enough to sit and walk, it is difficult to keep him from sitting on his feet. He sits on his feet on the floor because it is his "position of comfort." He sits on his feet at the table because it makes him taller and he can more easily reach things. He sits on his feet in the movies because he can see better. It is necessary to change this faulty sitting habit. The child should have a small chair of his own so his feet can touch the floor. If he has to sit in a large chair, he should have a stool on which to rest his feet.

When outward rotation of the legs and flatfoot deformity are already established, attempts should be made to correct the outward rotation as well as the flatfoot deformity. The mother is taught to place the child on his back, to grasp his knees and rotate his legs medially as far as they will go, and to stretch them in gently. This turns the legs in the opposite direction from which they have been held by sitting. She should hold them for half a minute, release them for a few seconds, and then repeat the exercise. Several minutes should be spent night and morning in doing this.

It has been customary to treat the flatfoot deformity by ordering some brand of "swung-in" shoes. There are many on the market with attractive trade names. Some are swung in more than others and some are heavier than others. All have the forefoot swung in as compared to the heel, with the medial border of the heel raised one-eighth inch and carried forward a little way. These "corrective" shoes may be all that is needed in very mild cases, but they will not correct a severe flatfoot deformity.

Children with more severe flatfeet should wear swung-in shoes and the mothers are carefully taught to stretch the children's feet in the opposite direction to undo the deformity which has been produced by gravity and by faulty sleeping and sitting positions. The forefoot is turned in toward the opposite foot to form an arch in the foot (fig-

FIGURE 4a. The method used to stretch a flatfoot to restore an arch to the foot. The third finger is placed beneath the ball of the foot, with the thumb on top of the great toe and dorsum of the foot. This gives a secure hold on the forefoot. The index finger is free to exert pressure on the medial border of the foot.

FIGURE 4b. The index finger finds a pea-shaped prominence on the medial border of the foot, about halfway between the base of the great toe and the heel. This is the tubercle of the navicular. Pressure is exerted straight in toward the middle of the foot, not upward.

FIGURE 4c. The heel is placed in the middle of the palm of the other hand and a firm grasp is made on the heel. The heel which was in valgus position is turned to slight varus position. The middle finger of the hand around the heel is allowed to press on the tip of the other index finger, in order to increase the pressure inward on the middle of the foot. The heel is held firmly as the forefoot is carried in toward the other foot: this forms a high arch.

FIGURE 5. The patient is fitted with an extra pair of swung-in shoes for night wear. These are attached to a bar, which can be adjusted to turn the legs in medial rotation. This corrects the lateral rotation of the legs. The bar may be bent toward the body and this tilts the feet from a valgus to a varus position and helps correct the flatfoot deformity. If the correction is increased gradually there is no discomfort.

ure 4). The foot is held in this position for half a minute, released for an instant and stretched again. This turns the foot in farther than the shoe does and farther than the child does in his daily activity. It seems that stretching the ligaments and muscles for a long period does more than a manipulation to correct the foot. The child objects less to a firm, steady stretching than to a wiggling of the foot. We suggest that the mother at first slowly count to 30, in order to get her to hold the foot for a full half-minute. Five minutes should be spent night and morning on each foot. A game may be made of it. The stretching should be done at the same time every day so that it is not overlooked. It may be done after the morning bath or when preparing the child for bed.

The child is observed again in a few weeks and the mother shown how to stretch the feet more efficiently. If after six or eight weeks, the legs still roll out, the child should wear shoes at night which are attached to a bar that holds the legs in medial rotation (figure 5). The shoes are set on the bar to rotate the legs inward only a little at first. The medial rotation is increased gradually. The bar is bent toward the body; this will invert the ankles and help correct the flatfoot deformity at the same time.

When the child is just learning to walk the lightest of the swung-in shoes are ordered. Later stronger shoes are prescribed. For overweight boys, the heaviest shoes are used. If these shoes break down under the arch, a metal arch support is made to fit the shoes and the feet by the brace maker. When the child is old enough to learn, he is taught the usual exercises to correct flatfeet. There are a few very rigid feet which may require plaster casts for correction. These feet can best be treated by the orthopedist, who is skilled in the use of plaster casts in the treatment of clubfeet and other foot deformities.

Many feet treated by the method described will develop normal arches. Those which do not seldom cause any trouble if this treatment is continued for several years.

Summary

Most flatfeet are associated with outward rotation of the legs and are caused by faulty sleeping and sitting habits. Flatfeet can be prevented by correct sleeping and sitting posture. When the deformity is present, the outward rotation of the legs, as well as the flatfoot deformity, must be corrected. Swung-in shoes are helpful, but the most important part of the treatment is the correct manual stretching of the feet over a long period of time.

Celiac Disease

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SINCE its first description by Gee[1] in 1888, celiac disease has remained a baffling problem, which laboratory investigation has done little to solve. It is true that laboratory tests must often be used to exclude other disorders which may resemble celiac disease (notably the examination of the duodenal juice for trypsin in the diagnosis of fibrocystic disease of the pancreas), but there is no specific test which places the diagnosis of celiac disease beyond all doubt. The diagnosis remains fundamentally a clinician's problem, and treatment is, in the main, a matter of clinical trial.

Even the name tells little, and yet to use in its place the term "celiac syndrome" has little to recommend it. Use of this term tends to group together conditions which on clinical and laboratory grounds are readily distinguished (for instance, pancreatic fibrosis and the steatorrhea that may be associated with tuberculous mesenteric adenitis or *Giardia intestinalis* infection) while throwing doubt on whether the clinical entity of celiac disease has, in fact, a separate existence.

Symptoms

The symptoms have been described so often that there is no need to recount them in detail. The children are born seemingly healthy and at first thrive normally. In England most cases begin between 6 months and 2 years of age, at a time when the diet is changing from one of milk to a variety of foods. Not infrequently an attack of gastroenteritis may mark the onset. According to Andersen and di Sant' Agnese,[2] half the cases in New York have an earlier onset, within the first six months of life, some actually dating from birth. This perhaps may be explained, to some extent, by the shorter period of breast feeding in that city, and the earlier introduction of mixed feeding to American children than to their British counterparts.

Vomiting at the onset is fairly common, but does not remain a prominent symptom. From an early stage, loss of appetite is a striking feature. The weight ceases to rise, the temperament changes to one of peevishness and irritability, and the bowel movements increase to about four or five daily and become loose, unformed, offensive and light in color. If the condition is suspected at this early stage, instead of being dismissed as a teething phenomenon or regarded vaguely as a dyspepsia of some sort, then without having recourse to laboratory investigations, a trial on a diet corrective for celiac disease should be made promptly. At this stage a satisfactory response to dieting can be expected with confidence and, incidentally, such a response could be considered confirmative of the early diagnosis.

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Until efficient treatment is instituted, the disease—which is in no way self-limited—will steadily progress, leading eventually to quite profound emaciation. The child is the picture of misery; the muscles become toneless and flabby, and anemia—usually hypochromic, but occasionally megaloblastic and responsive to folic acid—may reach a severe degree.

In comparison with the wasted limbs, the distention of the abdomen is very obvious. The soft, toneless abdominal wall makes palpation easy, and almost invariably the liver is strikingly small. Normally, in a young child, the lower border of the liver is easily felt a full fingerbreadth below the costal margin; but in celiac children, the liver may be entirely out of reach behind the costal cartilages, or perhaps just felt in the xiphisternal notch. The smallness of the liver, first pointed out by Still,[3] is a clinical point of some importance, since it helps to distinguish these children from those with other forms of chronic indigestion or from those suffering from steatorrhea for other reasons.

History

The cause of celiac disease has long remained obscure. Analysis of the pale, greasy stools shows them to contain an excess of fat, the proportion of digested to undigested fat being normal. This seems to indicate a defect in the mechanism for absorbing fat from the intestine. On the other hand, the abdominal distention caused, in the main, by excessive fermentation and production of gas, the appearance in the stools of an undue amount of starch granules, and the readiness with which diarrhea is provoked by feeding starchy foods all point to an intolerance toward this element of the diet. In past years these two aspects of the condition have been the principal factors in deciding treatment. Some physicians have insisted on a severe restriction of fat intake, which, as one might expect, leads to a reduced output of fat in the stools. Others have paid more attention to restriction of starchy foods. For most of the children, both elements of the diet have been withdrawn, leaving protein as the main source of nutrition, together with carbohydrate in its simpler forms of mono- and disaccharides and overripe banana with its high content of levulose.

A generation ago, when knowledge of vitamins was in its infancy, and these could only be provided in their natural states, the vitamins were often so badly tolerated that complications due to vitamin deficiency were common enough. But with the identification of the chemical structure of the vitamins and their production in pure or synthetic forms, ample vitamin protection is now an easy matter, and vitamin deficiency complications are no longer a problem.

It is perhaps of interest that in his original description of the disease, Gee[1] was not afraid of feeding fats to these children, and indeed recommended that a trial of cream and fresh butter should be made. To Howland (1921)[3a] belongs the credit for basing a dietary regimen on the exclusion of starches, a treatment also advised over many years by Haas.[4] British pediatricians, led by Still[3] and Parsons,[5] certainly recognized the need for reducing starch intake, but held firmly to the view that failure to absorb fat was the primary trouble. Consequently, a severely fat-free diet was the basis of treatment, and although starches were also restricted, they were restored to the diet before fat in any quantity was allowed.

Mention must also be made of the interlude just before and during the last war, when the role of vitamin B was under consideration and gave rise to a temporary vogue for treatment—somewhat unpleasant for the children—with courses of injections of vitamin B and liver preparation. Meanwhile, investigations along other lines, such as vitamin A absorption defects, glucose absorption, and the pattern and speed of gastric and intestinal movements, were being pursued by many workers without exerting any profound influence on treatment. The outlook for the celiac child before the war was by no means satisfactory. The most definite aspect of the prognosis was that the disease carried a fairly considerable mortality. Hardwick,[6] in a review of the literature, found an over-all mortality

of 15 per cent in 544 cases. The outlook for those who recovered was less clear. Many children had recovered by puberty, if not before, but all too often the retardation of growth during the severe phase of the illness left its permanent mark in some degree of dwarfing. For some children, intolerance of fat and easily provoked diarrheal episodes persisted into adult life. Nevertheless, some workers, notably Haas and Haas,[7] using a diet entailing the strict exclusion of cereals with an early return to fats and fruits, have been able to claim more satisfactory results.

Fat Balances and the Significance of Gluten

The employment of fat-balance investigations has thrown a good deal of light on many of the basic problems of celiac disease. In the first place, the investigations have revealed that, while normal children absorb from 90 to 95 per cent of their dietary fat, if celiac children are fed a normal diet, their fat absorption falls to a figure varying from 59 to 85 per cent, according to the severity of their illness. Although such a deficiency leads to the passage of unpleasant stools, from the nutritional standpoint, the amount of dietary fat absorbed is much more significant than that which is voided. If a child can absorb from half to three-quarters of the dietary fat, the fact that more than the usual proportion is voided is not a sound reason for making the diet so free of fat that the child has no opportunity of absorbing any fat at all. Indeed, if one were prepared to overlook the unpleasantness of the stools, there might be a case for feeding a high fat intake, in order that the total amount of fat absorbed daily might approximate the normal.

Fat balances have also been used to find out whether the mishandling of starchy foods by celiac children might be the primary difficulty, the failure to absorb fat being in some way dependent on the failure to deal with starches. By feeding these children a normal amount of fat over periods when starchy foods were given, or were being withheld, it was shown that the withholding of starches led to a rise in fat absorption averaging 15 per cent. This was sufficient in some of the children to restore the fat absorption to a normal level.[8] Although it was not the purpose of this investigation, it was quickly realized that a diet devoid of all starchy food, but with a normal fat allowance, led to a dramatic improvement in the state of the children viewed from all clinical angles. In consequence, the previous policy in England of feeding a very low fat intake was changed to one of simply withdrawing from the diet all starchy foods. This was easy to achieve within the hospital, but, in a country still undergoing rationing of fats, it was a difficult diet to maintain when the children returned to their homes.

Meanwhile, investigations in Holland were carrying our knowledge an important stage further. Dicke[9] and Weijers and van de Kamer,[10] using fat absorption tests as the basis of their work, showed that the harmful effect of starchy foods lay in the protein component (gluten) of wheat flour and rye flour. If this protein was removed, the remainder of these flours, consisting of pure starch, was tolerated perfectly well by celiac children. Other starch foods, such as maize, potato and rice, in which the protein was of a different nature, consisting of albumins and globulins, were without injurious effect. The adverse influence of gluten has been confirmed in Birmingham (England) by Anderson et al.[3b] and in London by Sheldon and Lawson.[11] Thus, the problem of dietary management of celiac children has narrowed down to giving a diet which avoids gluten. With our knowledge at this stage, it is of interest to note that other successful diets in celiac disease have incidentally been free of gluten, although the benefit may have been ascribed to other characteristics.

The manner in which gluten operates harmfully is not yet understood. Allergy to gluten does not seem to offer an explanation. At any rate, skin tests by scratch and intradermal application have been, in our hands, uniformly negative. Weijers and van de Kamer[12] have shown that the introduction of wheat flour to the celiac child increases the fecal fat by raising the output of saturated

fatty acids, while unsaturated fatty acids are not affected, and these investigations postulate a defect in intermediary metabolism. Gluten consists of the glutinous residue remaining when wheat flour is repeatedly washed with water to remove the soluble starch, and is composed of two proteins—gliadin and glutenin. By feeding these proteins separately, van de Kamer and co-workers[13] consider that the harmful effect of gluten must be sought mainly in the gliadin fraction. Similar experiments at The Hospital for Sick Children in London have not yet enabled a definite opinion to be expressed. These proteins were fed to 7 celiac children. One, an 11 year old girl, seemed unaffected by either protein, and her fat absorption remained at 90 per cent. In the other 6 children, between 12 months and 9 years of age, both proteins were capable of having an adverse effect on the weight gain, and in some of the children gave rise to troublesome anorexia with a lowering of the fat absorption. It must be pointed out, however, that exact separation of these proteins, so as to obtain each in a pure state, presents considerable difficulty.

In a recent communication, Dicke et al.[14] reported a lowering of fat absorption in one celiac child after feeding oat flour. This has led them to speak cautiously of the adverse faction in gluten as the "wheat factor," this factor being present also in rye and oats and possibly in other foodstuffs not as yet tested. We have not so far experienced any setbacks when oat flour, usually in the form of porridge, has been allowed, although some of the younger children have disliked its taste and refused it. In a typical celiac girl, aged 4 years, a diet devoid of both gluten and oat flour led to a fat absorption (8 day balance) of 95 per cent. The addition of 2 ounces of oat flour daily to this diet had no noticeable effect on the child, and a repeat fat balance showed the fat absorption (8 day balance) to be at 97 per cent. In this connection, it is of interest that the protein moiety of oat flour consists of albumins and globulins, not of gluten.

Treatment

The dietetic objective is to establish a celiac child on a gluten-free diet. In a mild or early case, this may be a simple matter, since it simply entails the avoidance of wheat or rye protein. In England, the Energen Foods Company, Ltd., separates wheat flour into its protein and starch components in the course of preparing their particular food commodities. They are able to make available for celiac children the wheat starch which, by means of special recipes, can be made into bread, biscuits and cakes, thus taking the place of whole wheat flour. Such recipes are necessary because in the absence of gluten, a wheat starch loaf would crumble to pieces unless some substitute for the binding properties of gluten were used. Its place is taken by fat (margarine) and milk. One may perhaps look forward to the day when celiac disease ceases to be a hospital problem. If the early symptoms are recognized and a strictly gluten-free diet is instituted at that stage, with the child still in his own home, rapid improvement should follow, and the downward trend until admission to the hospital becomes essential should be prevented.

When celiac disease has already reached a severe degree, the problem is more complex. A gluten-free diet remains the objective, but a month or more of skillful nursing and feeding may be required before this stage can be reached. To begin with, the diet may have to consist of such simple foods as skimmed protein milk, glucose, and banana purée. If the stools are frequent and watery, the addition of a pectin preparation may be advantageous. In the most severe cases, it may even be necessary to spend the first day or two in overcoming dehydration and a lowered plasma protein level by intravenous fluid therapy.

As the child improves, such foods as chicken, egg custard and biscuits made from soya flour are gradually added to the simple diet outlined. The skimming of the milk is meanwhile progressively diminished. The addition of fruit and foods made with wheat starch comes next, and finally flours that do not contain gluten, such as rice, potato and maize flours, are added. Care must be exercised in this last stage, for if given too soon these flours may give rise to abdominal discomfort,

in which case their employment should be deferred for a fortnight or so. As soon as the child has been restored to a full diet devoid only of gluten, he is ready to return home from the hospital. It remains to add that, of course, the diet must be supplemented with adequate vitamins.

Two other points ought to be mentioned. First, celiac children tend to react violently to acute infections; these must be promptly recognized and treated, while the presence of foci of chronic infection, which also hinder improvement, must be sought for and eradicated. Secondly, anemia will also hold up progress. If the degree of anemia is such that the hemoglobin is down to about 65 per cent, it is better to correct this speedily by transfusion of blood, reserving therapy with iron salts for anemia of less degree.

When a gluten-free diet is to be used in the child's home, the underlying principles are explained to the mother, and she is given a list of the foods that contain gluten which she must avoid when preparing the menu.[11] There would be little point in detailing this list in this article, since each country has its own proprietary foods and it would be necessary for American dietitians to prepare a list for American children as have our dietitians for British children. Many foodstuffs would, of course, be common to both lists, such as bread, biscuits, cakes and cake mixtures, noodles, macaroni and pastry mix. Arrangements are also made here for the mother to obtain regular supplies of wheat starch from the Energen Foods Company, Ltd., and she is given recipes for baking bread,* cakes and biscuits with this starch. When the children are of school age and if they have their midday meal at school, the position is explained to the school authorities, and the child takes to school his own supplies of bread, biscuits and cakes, and does not receive any of the school food that contains wheat flour. As this country is still rationed for fats, the Ministry of Food has authorized the issue of an extra fat ration for celiac children who are on a gluten-free diet. This has been found adequate to enable a proper use of wheat starch to be made.

*Sample recipe for wheat starch bread:

Wheat starch	12 oz.
Salt	1 tsp.
Castor sugar	1 oz.
Cooking fat	1 oz.
Yeast	1 oz.
Cold milk	8 oz.
mixed with	
Boiling water	4 oz.

Cream together the yeast and sugar; sift the wheat starch and salt together, and cut in the cooking fat. Mix together yeast and milk and water. Make a hollow in the wheat starch, add liquid and, with a knife, mix until a batter is made. Pour batter into a well-greased tin and place in a warm spot until the dough has doubled itself (about 20 minutes). Bake at 250° F. for 20 minutes and then at 350° F. for 5 minutes. Remove loaf from tin and place in the oven shelf for a further 15 minutes.

In our experience, the cooperation of the mothers in carrying out these directions has been all that could be wished, as has the attitude of the school authorities. The need for the strict avoidance of gluten is essential; if as little as one or two slices of ordinary bread each day leak into the child's diet, a deterioration of appetite and an increase in the bulk and number of stools are soon manifest. On the other hand, the disadvantage of allowing some gluten-containing foods to older children with celiac disease, especially if treatment has been in progress for a year or more, may be difficult to realize. In them, a cheerful disposition and a fair appetite may continue, and but little alteration in the stools may be detected. The main disadvantage may be simply a slackening off in the rate of growth in both height and weight, and, unless these are being carefully and regularly recorded, several months may elapse before the deterioration is recognized.

An obvious question to ask is how long a gluten-free diet should continue; but since the diet has only been employed in this country some three years, the answer cannot yet be supplied. The reply will depend to some extent on what one is trying to achieve. Already the mortality from celiac disease has been reduced to the vanishing point. But if these children are to survive, we surely cannot rest content if, in later life, they are to be prone to diarrheal episodes, or if their natural growth pattern, particularly as regards height, is to be at all curtailed.

It has already been mentioned that a pre-

mature return to gluten in the older celiacs may lead to a slowing down of the growth curve. Equally, we have learned that some of these older children, who have been back on a normal diet for two or three years, have accelerated their rate of growth when gluten has again been excluded from their diets. In other words, although they were growing while on a normal diet, they were not growing at their maximum rate, and a few years of retarded growth may easily leave its permanent mark. It seems increasingly doubtful whether the determination of cure, and a consequential return to a normal diet, can be based solely on clinical appraisal. Studies of this aspect of the disease are in progress, but some years may have to pass before the question of how long a gluten-free diet ought to be maintained can be answered.

The fact remains that for celiac children in England, the use of a gluten-free diet has entirely altered the outlook. It is no longer a killing complaint; the period of stay in the hospital has been greatly reduced; the change from a wasting and miserable child to one growing and happy takes place in a few weeks; and the dietetic requirements to bring about these results are both simple and cheap and can be carried out without difficulty in the child's home.

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MEETINGS AND POSTGRADUATE COURSES

American Diabetes Association: Second postgraduate course in diabetes and basic metabolic problems, January 18-20 at the Mayo Clinic and Mayo Foundation, Rochester, Minnesota. Program is under the directorship of Dr. Edward H. Rynearson and Dr. Randall G. Sprague. Additional information may be obtained from J. Richard Connelly, Executive Director, American Diabetes Association, 11 West 42nd Street, New York 36.

College of Medical Evangelists, Los Angeles: Alumni Postgraduate Convention, February 23-25, 1954, at the Biltmore Hotel, Los Angeles. The courses are planned primarily for general practitioners and are open to all physicians. Further information may be obtained by writing to the Managing Director, Walter B. Crawford, 316 North Bailey Street, Los Angeles 33, California.

University of Minnesota and the Minnesota Division of the American Cancer Society, Minneapolis: Course in cancer detection for general physicians, February 10-11, 1954. Physicians will observe and participate in the diagnostic activities in the University's Cancer Detection Center. The Lyon Laboratories, the Medical School's new cancer research unit, will be dedicated on Thursday, February 11 with a program and dinner.

University of Minnesota, Minneapolis: Continuation course in fundamental advances in internal medicine for internists, February 15-17, 1954, at the Center for Continuation Study. Basic concepts in the fields of infectious disease, gastroenterology and hematology will be discussed. Faculty will include Dr. Walter Lincoln Palmer, Professor, Department of Medicine, University of Chicago School of Medicine and Dr. David Shemin, Associate Professor, Department of Biochemistry, Columbia University College of Physicians and Surgeons, New York City. The course will be presented under the direction of Dr. Cecil J. Watson, Professor and Head, Department of Medicine, and the remainder of the faculty will be made up of members of the University of Minnesota Medical School.

Continuation course in child psychiatry for general physicians, pediatricians and psychiatrists, February 1-5, 1954. Course will consist principally of small group discussions of common problems, with a minimum of didactic lecture material being presented. The program will be presented under the direction of Dr. Reynold A. Jensen, Professor, Departments of Psychiatry and Pediatrics at the University of Minnesota Medical School.

Editorials

Postgraduate Medicine

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JUVENILE FIBROMATOSES

One of the strange phenomena which occasionally affect human somatic tissues is a tendency for its fibrous elements to proliferate unduly. The results of this are varied and sometimes bizarre. In adults some of these are well known, such as the fibromatosis which thickens the palmar fascia to produce Dupuytren's contracture, a comparable process in the plantar fascia, induratio penis plastica or Peyronie's disease, and keloids and other tumorlike proliferations of scar tissue. In infants the only fibrous proliferation which is well known is that which develops a few days after birth in the sternomastoid muscle and may lead to wry neck if untreated. It has been assumed to be more frequent after breech deliveries and to follow tearing of the muscle fibers, although this has not been proved. Removal of the muscle with the fibrous tumor will cure the condition, prevent wry neck and leave no untoward aftereffects, according to Barrett Brown. But this is not the only variant of fibromatosis which can develop spontaneously in the neck of infants a few months old as well as in older children. Others may be serious because of unchecked infiltrative growth and even kill the child, although this is extremely rare.

The neck is only one part of the body where fibromatoses are found. Others are the hands and feet, the shoulder region and the buttocks, thigh and leg. It is very exceptional indeed for them to be found anywhere else. The fibromatoses affecting the palmar and plantar fascias to such an extent that actual tumors are formed account for only about 20 per cent of the juvenile fibromatoses in the hands and feet. The rest are growths of great variety, from the relatively innocuous juvenile aponeurotic fibroma that seems to single out the short flexor muscles especially in the palm, described by Keasbey, to far more serious infiltrative growths resembling desmoids and differentiated fibrosarcomas which may result in the loss of a digit, hand or foot.

These fibromatoses are not always solitary lesions. For example, more than one finger may have fibrous growths, or several toes can be involved. When multiple subcutaneous or muscular fibrous nodules form in the neck or shoulder region it may be an indication that the unfortunate child will later develop bone around the shoulder and hip joints and the vertebrae, resulting in virtual immobiliza-

tion of those joints, a peculiarly painful and distressing disease known as progressive ossifying myositis. Rarest of all is the extraordinary generalized congenital fibromatosis in which the infant is born with multiple fibrous nodules, not only in most of the superficial tissues but in a majority of the viscera as well. Such infants are unable to survive and die a few hours or days after birth.

These fibromatoses are twice as frequent in male children as in female, and nearly half of them make their first appearance in the first year of life. So few of them are related to trauma as to make that an unimportant factor, and very rarely indeed are there associated congenital malformations such as multiple chondromatoses. They are not relatively more frequent in Negroes as are some other fibrous growths. No one has suggested any phylogenetic basis for them as has been done for certain nevoid growths. For example, skin angiomas are reputed to be atavistic structures representing the network of skin capillaries in those amphibia which do not have lungs but accomplish gaseous exchange in the skin, and pigmented moles are called remnants of the pigmented tactile spots of amphibia. Actually the etiology of juvenile fibromatoses is unknown.

These growths pose extremely difficult problems of diagnosis and therapy. For the pathologist usually is unable to predict on the basis of histopathology exactly how most fibromatoses will behave. They can be distinguished from potential metastasizing tumors and, if the exact location of the lesion and age of the child are known as in early postnatal sternomastoid tumors, plantar fibromatoses and juvenile aponeurotic fibromas, an accurate behavior prediction can be made. But for the majority this cannot be done; a simple desmoid may cost an extremity or even life, while a differentiated fibrosarcoma may remain cured even after incomplete excision. However, since many have been cured eventually by conservative surgery and it is always possible to be radical if conservatism fails, this would seem to be a legitimate guiding principle.

ARTHUR PURDY STOUT

SATELLITE MEDICAL RESPONSIBILITY IN NATIONAL DISASTER

As a nation we find ourselves the leaders of the democratic segment of a world divided into two major ideologic camps, fearful lest the totalitarian segment precipitate a war which, if unleased in total form, may well mark the end of modern civilization. In the midst of predictions ranging from the words of prophets of doom to the saner pleas for reason, many will cling to the hope that the very magnitude of the destructive potential inherent in modern instruments of war may curb the hands of Mars and prevent global suicide. In a world environment fraught with national tensions it is the duty and responsibility of American medicine to prepare for possible devastation with the sincere prayer and deep hope that the results of this preparation never culminate in disaster application.

Unfortunately, there are physicians who look on the organization of civil defense programs with a degree of skepticism and, in some cases, accept an almost fatalistic philosophy that the catastrophe will be so absolute that little can be accomplished in the salvaging of human lives. Obviously this is not only an inaccurate but also a most dangerous point of view and not in keeping with the facts at hand nor the traditions of American medicine. Another larger group clings to the hope that a routine of civil defense can be forged out in the fire of actual enemy attack and, in support of this thesis, point out the gradual evolution of a system of survival developed in England during the early days of the past world war. The fallacy of this argument lies in the fact that we are no longer planning a defense in terms of conventional attack but rather a survival in the face of atomic and hydrogen bombs. Thus the initial blow may well be the most critical, and there will be no time for the development of a civil defense organization through an evolutionary process.

In recent months major cities of our nation have been listed in what might be considered by the enemy as target priority potentials. This probably has stimulated large industrial

and population centers in their civil defense planning. In contrast, many smaller communities have accepted with a certain sense of relief their apparent insignificance in the national scale of productive importance. This, in spite of the fact that the medical support afforded larger cities by smaller satellite communities may in many instances be the only help available in the event of enemy attack. The aftermath of destruction resulting from the newer weapons of war are hard to appreciate in terms of square miles destroyed or thousands of lives lost; nevertheless, following such an attack, the average modern city will contain few functional hospitals and, depending somewhat on the time of the explosion and period of warning, may lose 50 per cent or more of its doctors. In view of the usual concentration of specialists in downtown sectors, the toll of physicians in this category may be inordinately high. Utilities afford a vulnerable target to the newer instruments of war; thus even those hospitals left standing in the metropolitan periphery may be deprived of elevators, light, water and heat.

In the light of the destructive possibilities of total war it becomes increasingly apparent that much of the medical responsibility for human salvage in the event of national disaster will rest with the satellite communities surrounding our larger cities. The area concept of responsibility must be stressed and closely coordinated plans developed between the metropolitan unit and the adjacent towns. With the loss of hospital facilities in one area patients must of necessity be moved to more distant satellite centers for medical care. Professional teams from peripheral towns must be organized to move toward ground zero in order to triage and render emergency aid to the casualties. The Armed Forces have long recognized this basic principle of medical organization and established a chain of patient evacuation, removing the wounded to satellite hospital units beyond the zone of combat destruction where adequate personnel and facilities are available.

MELVIN A. CASBERG

Retired January 1, 1954, as
Assistant Secretary of Defense (Health and Medical)

MUMPS

FOR some years investigators have been studying the possibility of preventing mumps by inoculation. Prolonged epidemics have been a hazard to military populations. The complications are especially feared by growing young men. At Great Lakes Naval Training Center a vaccine was prepared by growing virus in chick embryos.[1] The virus-containing fluids from the egg were then treated with alcohol to concentrate the virus and the resultant fluids were made noninfectious with ultraviolet light. The investigators report that antibodies against the virus were stimulated in the blood of 80 per cent to 85 per cent of men who had never had mumps. The levels were sufficient to protect children against mumps. In the absence of an epidemic final conclusions cannot be stated, but tests are contemplated should an outbreak of mumps occur. The vaccine has been determined to be safe and the dose needed for greatest stimulation of protective antibodies is known.

MORRIS FISHBEIN

1. Prophylaxis of epidemic parotitis. Project Report, Bureau of Medicine and Surgery, U.S. Navy, Medical News Letter 22:5, 1953.

CHARMING THE GERMS

AN amazing contribution to medical science at the recent meeting of the International Congress on Microbiology in Rome in September came from Richard de Silva of the Medical Research Institute in Ceylon. He reported some experiments that he had undertaken about 25 years previously to determine whether or not mental influences could inhibit the growth of bacteria. In the experiment, parallel culture plates were inoculated with typhoid bacteria. Then "concentrating intensely on one member of each pair" of plates, the formula "no growth, no growth, no growth, you are sterile, you are sterile, you are dead, you are dead, you are dead" was repeated for 30 minutes. The plates were then put in the incubator, and Dr. de Silva reports there were always fewer colonies on

the plates submitted to the formula than on the control.

This observation was the subject of much amusement to the assembled bacteriologists. Unfortunately, it was impossible to find out the language used in addressing the germs, whether English or Hindustani, or any other. Those who have had the experience of being almost talked to death will understand that a germ may want to curl up under similar circumstances.

MORRIS FISHBEIN

SUDDEN OR UNEXPECTED DEATH IN INFANCY

ONE of the most regrettable and disturbing incidents that can occur to any family is to have an infant die suddenly or unexpectedly in bed, apparently from some wholly unknown cause. If the child is found dead face downward or beneath the bedclothes or if the child has been in bed with his parents, asphyxia or strangulation is diagnosed. The pathologists of an earlier day had much to say about "overlaying" as a cause of such deaths. The modern pathologist makes a thorough postmortem examination and includes microscopic, bacteriologic and serologic investigations.

Since 1947, Dr. K. M. Bowden* of Melbourne, Australia, has investigated 320 instances of sudden or unexpected deaths in childhood. The majority of the children were found dead in bed and had not been considered seriously ill. More deaths occurred among male than female children in a proportion of 11 to 7. By far the majority of deaths were due to acute infections in the respiratory tract, accounting for 133 of the 320 cases. About one-half of the deaths occurred in infants less than 6 months old. In most instances the child apparently had not been ill, but a careful inquiry indicated that 77 of the 140 children had actually shown signs and symptoms of illness. In some cases the child may have had a temperature of 103° F. or even 105° F. before death. The necropsies did not yield anything to explain the rapid deaths.

A careful check of 70 consecutive cases in Melbourne revealed that 10 of the children were found dead with their faces downward on the bedding or under the bedclothes. One child actually was found lying dead in his pram on his back with the family cat curled up asleep on his face. This has often lead to the superstition that the cat sucks the breath and thus kills the child. Instead evidence of acute infection in the respiratory tract was found. In some cases nonspecific, acute myocarditis, septicemia or meningitis were found to be involved.

A coroner should not accept a diagnosis of accidental suffocation or "overlaying" in the absence of a postmortem investigation.

MORRIS FISHBEIN

*BOWDEN, K. M.: Sudden or unexpected deaths in infancy. Journal of Forensic Medicine 1:19 (July-September) 1953.

MEDICAL PROGRESS, 1953

EARLY in 1953 Dr. Jonas E. Salk of the Virus Research Laboratory in the University of Pittsburgh School of Medicine reported that antibodies against poliomyelitis could be stimulated by inoculating intramuscularly a vaccine prepared with tissue culture fluid. Before the meeting of the American Academy of Pediatrics in Miami, Florida, October 9, 1953, he showed that it is possible to stimulate antibody formation in human subjects against the three types of poliomyelitis virus. Children and adults, who do not have antibodies to any of the poliomyelitis viruses, can form antibodies to the three virus types. Another observation reported by Dr. Salk is the extraordinary height to which antibody level can be raised in persons who have some antibody initially. When an antibody is present before vaccination, a rise occurs, as if the inoculation has a booster effect. Moreover, he is able to state unequivocally that the results are due to the antigenic substance in the inoculum and not due to any particles of living virus that may be postulated to be present.

Conclusions cannot yet be drawn concerning the total persistence of antibodies until sufficient time has elapsed and a sufficient

number of serums have been tested. The next step is a large scale inoculation of hundreds of thousands of children to be undertaken next spring. It will probably be a controlled study involving the injection of alternate children with another vaccine.

New Operation for Parkinsonism

A new artery-crushing operation is reported to have brought relief to some cases of tremor such as occurs in Parkinson's disease. The operation, reported by Dr. Irving S. Cooper of New York, was announced at a meeting of the American Neurological Association. In this procedure the anterior choroidal artery, a branch of the internal carotid artery, is blocked. Dr. Cooper reported trial in 10 cases of Parkinson's disease with 1 death and also in 5 cases with other motion disorders.

Adrenal Hormones

In September Dr. Tadeus Reichstein, who shared the Nobel Prize for cortisone and hydrocortisone with E. C. Kendall and Philip S. Hench, announced the isolation of another hormone from the adrenal cortex. Several British and Swiss scientists participated. The product was isolated in pure crystalline form from beef adrenal glands. Twenty-two milligrams were extracted from 500 kg. of beef adrenal glands. Provisionally the hormone is called electrocortin; it is concerned with utilization by the body of minerals such as sodium and potassium and is said by Dr. Reichstein to be 50 to 100 times as potent as desoxycorticosterone acetate, called DCA.

The adrenal hormones and ACTH from the pituitary continued to be used in a wide variety of conditions, such as intractable asthma and other allergic conditions; rheumatoid arthritis and rheumatic fever in which striking improvements may occur; inflammatory eye diseases; such skin conditions as angioneurotic edema and exfoliative dermatitis including cases resulting from allergy to drugs. Some other conditions of the skin, formerly nearly uncontrollable, in which cortisone has yielded amazing results are pemphigus, scleroderma and dermatomyositis. Cortisone is also the first medicament to have some beneficial effect on disseminated lupus erythematosus. Cortisone has also been helpful when injected into bursae and joints, in endocrine disorders, in inflammatory conditions like sarcoidosis, and in periarteritis nodosa. Cortisone was said to be helpful in Bell's palsy by diminishing swelling around the nerve where it passes through a bony canal near the ear. Benefit has been reported in many cases of idiopathic thrombocytopenia in which easy bruising and bleeding occurs along with a deficiency in blood platelets. Another blood disorder with reported benefit from cortisone is erythroblastosis in which there is destruction of red blood cells as a result of different reactions of the Rh factor in the parents.

Antibiotics

Several new antibiotics are now under investigation including Fumagillin used to advantage in amebic dysentery; Neomycin against tuberculosis; Tetracycline which is effective in pneumonia, dysentery and typhoid; Erythromycin which resembles penicillin; Magnamycin and Amicetin which also prevent growth of a variety of germs.

Among the other amazing observations was the reported action of hyaluronidase in preventing the formation of kidney stones; the action of ATABRINE® dihydrochloride against lupus erythematosus; ammus majus, an Egyptian plant remedy said to be useful in vitiligo; rauwolfia serpentina, a plant remedy from India, said to have been used on Mahatma Ghandi for control of high blood pressure; and a solution of 30 per cent euphorbium in 95 per cent alcohol used in treating warts on the soles of the feet.

Cholesterol Research

A vast amount of research is now centered on hypertension and arteriosclerosis. Drugs based on hexamethonium have gained increasing support. The chief interest, however, has been in testing the nutritional factors said to underlie arteriosclerosis. Large molecules of fat combined with proteins have been observed in the lining of blood vessels. Another test determines the amount of cholesterol circulating in the blood. Dr. Frederick Stare and

his associates at Harvard University have developed a technic for the production of atherosclerosis in the Cebus monkey. The atherosclerosis is produced in the short period of 18 to 20 weeks in adolescent monkeys on a diet low in the sulfur amino acids and with added cholesterol. Neither the lack of sulfur amino acids nor the added cholesterol will by itself produce the disease in the length of time these monkeys were studied.

Dietary restriction of cholesterol and fats, both animal and vegetable, does not necessarily influence lipoprotein molecules or serum cholesterol unless the diet is almost completely devoid of these materials. Such restriction is impractical in treatment. From a practical point of view, the best diet for the person with atherosclerosis is one which provides good nutrition, preferably one that is high in protein, and with calories to reach or maintain desirable weight.

Swank has said that a high fat diet is a factor in multiple sclerosis. Another investigator found that administration of female sex hormones to men with abnormally high cholesterol restored the blood to normal. Irradiating rabbits produced resistance against action of cholesterol in causing hardening of arteries. Some substance in brain tissue was found by University of Chicago investigators to diminish high cholesterol in the blood.

New Drugs

A hormone of the anterior pituitary called oxytocin was synthesized. Several new drugs such as 6-Mercaptopurine and Triethylene Thiophosphoromide (called Thio-tepa) were able to destroy excess white blood cells in leukemia. In addition to heparin, DICUMAROL® and tromexan, a new anticoagulant used in coronary and other thromboses, is 2-phenyl-1,3-indanedione.

Celiac Disease

An extraordinary discovery was the observation that wheat, barley and rye are related to the development of celiac disease in which infants are unable to digest fats. When these substances are removed from the diet, the patients recover.

Surgery

Tremendous progress has resulted in surgery from advances in physiology, preoperative and postoperative nutrition, use of new anesthetics, blood transfusion and antibiotics. Of the first thousand "blue babies" operated on in Johns Hopkins, 843 survived, and the condition of 674 of them showed good results. New operations on the heart are correcting narrowing of the mitral valve and of the aorta. In hypertension, due to difficulty in passing blood through the liver, a shunt operation is proving successful.

Studies on Smoking

A great furor is developing over the concept that smoking of cigarettes is definitely related to an increased incidence of primary cancer of the lung. Surgeons warn against it. The use of filter-tip cigarettes has increased many hundreds of times. Studies are under way by the American Cancer Society, the National Cancer Institute, the Medical Research Council in Great Britain and many other agencies. Research has shown that an adequate filter removes much of the irritating tars and lowers nicotine content of cigarette smoke. The exact mechanism of this process is not yet understood. Pipe smokers, as shown by British and Danish studies, were not similarly affected as cigarette smokers.

Rehabilitation

Rehabilitation centers are springing up rapidly in the United States. The injured and handicapped are often restored to functional competence.

Medical Insurance

More than 91,000,000 Americans are now voluntarily insured against the costs of hospital care, and many millions carry insurance to cover costs of surgery. As the year ended, the Commission on Financing of Hospital Care was preparing to publish its studies and recommendations for lowering costs and for enabling all, including those with low income and the indigent, to receive hospital care whenever needed.

MORRIS FISHBEIN